

行政院國家科學委員會專題研究計畫 成果報告

家庭社經地位、父母教養方式及作為對青少年學習表現之 影響(第2年) 研究成果報告(完整版)

計畫類別：個別型
計畫編號：NSC 96-2412-H-004-006-MY2
執行期間：97年08月01日至98年10月31日
執行單位：國立政治大學社會學系

計畫主持人：關秉寅

計畫參與人員：博士班研究生-兼任助理人員：王枝燦

報告附件：出席國際會議研究心得報告及發表論文

處理方式：本計畫可公開查詢

中 華 民 國 99 年 01 月 31 日

行政院國家科學委員會補助專題研究計畫 ☒ 成果報告
☐ 期中進度報告

家庭社經地位、父母教養方式及作為對青少年學習表現之影響

計畫類別：☒ 個別型計畫 ☐ 整合型計畫

計畫編號：NSC 96-2412-H-004-006-MY2

執行期間：96 年 8 月 1 日至 98 年 12 月 31 日

計畫主持人：關秉寅

共同主持人：

計畫參與人員：盧科位、王枝燦

成果報告類型(依經費核定清單規定繳交)：☐ 精簡報告 ☒ 完整報告

本成果報告包括以下應繳交之附件：

☐ 赴國外出差或研習心得報告一份

☐ 赴大陸地區出差或研習心得報告一份

☒ 出席國際學術會議心得報告及發表之論文各一份

☐ 國際合作研究計畫國外研究報告書一份

執行單位：國立政治大學社會學系

中 華 民 國 99 年 1 月 30 日

中文摘要

本研究計畫的主要目標是利用「台灣教育長期追蹤資料庫」於 2001 及 2003 年蒐集之第一波及第二波的資料，分析國中生及高中職五專生所知覺之父母教養方式，以及家庭社經地位與教養方式之間的關係。

本研究利用 Mplus 對與教養方式相關的類別變項，從事兩個階段之探索性及驗證性因素分析。第一階段研究是分別探索父親及母親的教養類型。此階段研究發現台灣青少年的父親及母親的教養方式可以分成明確常規要求、嚴厲管教及支持回應等三個面向。不論是國中生或高中職五專生樣本，當家庭社經地位較高時，母親比較不嚴格管教子女行為，而比較傾向支持及回應子女的要求，但在嚴厲教養方式上，則與社經地位無關。但是父親教養方式則國高中生有所不同。研究發現顯示，社經地位越高的國中生家庭，父親只有在支持回應的面向上會顯著較高，在明確常規要求及嚴厲管教上則無差異。但在高中職五專階段，父親社經地位越高者，則在常規明確要求、嚴厲及支持回應三個管教面向均增加。前二者與研究假設預期是相反的。這個發現也與國外發現父母對青少年的管教會逐漸傾向讓青少年自主不同。

第二階段研究則以學生為中心，分別探索國中生及高中職五專生所知覺到之父母親共同教養方式的類型。此階段研究結果顯示，不論是國中生或高中職五專生所知覺之父母親共同教養方式類型，可分為 5 類，其中有兩類是認定父親會做明確常規要求，以及父親會嚴厲管教者。另兩類則認定母親會做明確常規要求，以及母親嚴厲管教者。第五類則知覺父母皆會給予支持回應。本階段研究進一步將父母親的社經地位的潛在變項，以及父母親在學業方面的教養作為的潛在變項納入分析模型中，分析社經地位、教養方式及教養作為對第二波學習成就的影響。研究結果顯示，如國中生父母的社經地位越高，則其父母比較會明確要求子女常規，也比較會支持回應子女，並且參與子女學習的教養作為的程度較高。除了父母支持回應對子女學習成就會有正面影響外，其他類型的教養方式，以及對學習參與的教養作為對學習成就的影響會因以父親或母親而不同。在高中職五專生方面，父母社經地位越高，則父親會比較明確要求子女常規及嚴厲管教，以及父母比較會支持回應，並有比較多參與學習的教養作為。同樣的，除了父母支持回應對子女學習成就會有正面影響外，父親明確要求常規及母親嚴厲教養的類型則對學習成就有負面影響。

關鍵詞：台灣教育長期追蹤資料庫、教養方式、教養作為、家庭社經地位

The main goal of the project this academic is to analyze the data collected by Taiwan Education Panel Survey in 2001 and 2003 to explore the parenting styles of Taiwanese parents as perceived by their children in junior high and senior high schools. The project also explores the relationship between the socioeconomic status of the family and parenting styles.

The present research proceeds in two stages. Using both exploratory and confirmatory factor analysis, the first stage explores the parenting styles of Taiwanese fathers and mothers separately. The research discovers that the parenting styles of either fathers or mothers can be classified into three dimensions: rigorous behavioral control, harsh parenting, and being responsive and supportive. The findings further show that, mothers of the higher family SES are perceived by both junior high and senior high students as more supportive of their children and less controlling. On the other hands, there is a difference in the perception of father's parenting style. Senior high students of higher family SES tend to perceive their fathers as more controlling and harsh than junior high students. Fathers of higher SES, however, are also perceived as more supportive.

The second stage of the research also uses both exploratory and confirmatory factor analysis to further explore how students perceive their parents' parenting styles jointly. The analyses discover five types of joint parenting styles. Four of these five types involve the perception of either fathers or mothers as the dominant party demanding rigorous behavioral standards or practice harsh parenting. The fifth type is the perception of both parents as being responsive and supportive. The findings further show that the relationships among the family SES, parenting styles, parental involvement of children's learning, and children's academic achievement depend on the stage of secondary schooling and whether father or mother is the dominant party in demanding their children to conform to behavioral standards. In general, the supportive parenting style has a positive impact on academic achievement.

Keywords: Taiwan Education Panel Survey, Parenting Styles, Parental Practices, Family Socioeconomic Status.

一、前言

國內外社會學、教育學及經濟學至少有上千篇探討家庭社經地位對其子女各類成就之影響力的論文。以高等教育普及的美國社會為例，美國社會學者即發現社經地位對教育取得或成就有持續且顯著的影響力，在二十世紀可說是一個社會事實（Hout and Dohan 1996; Hout et al. 1993）。這種持續且顯著的影響力也存在於不同社會及教育制度環境中（Shavit and Blossfeld 1993）。在台灣，譚康榮等人（Tam et al. 2004）分析了 TEPS 於 2001 年收集的大規模資料後，也發現父母的教育程度越高，其國高中子女的綜合分析能力的測驗分數也越高。此項研究也發現不論是在台灣或是美國，父母教育程度與家庭收入對測驗分數的影響型態與程度相近。

這些研究發現在某方面可說是理所當然的，因為對兒童或青少年來說，家庭是入學前最重要的學習環境。在他們入學後，家庭則仍然是學校以外最重要的社會化環境。家庭的環境會增強或削弱他們在學校的學習（Wang et al. 1993）。不同的家庭環境代表著經濟、社會及文化等資源的差異（Gamoran 2004）。但從 James Coleman 社會資本論的觀點來看（1988），父母即使擁有知識、技能及經濟上的資本上的優勢，也必須透過其與子女間良好的親子關係，才能使他們在子女生活中佔有重要地位。不然，這些家庭優勢是無法傳遞的。而子女在成長過程中，影響子女各種心理、智能與社會發展及親子關係的最重要因素之一，就是父母在日常生活中實施的教養方式與管教行為（Buamrind 1971, 1991; Collins et al. 1995; Holmbeck et al. 1995; Macoby and Martin 1983）。

西方社會學者與心理學者對於父母社經地位、教養方式及作為對於子女心智發展的影響，已有相當多的研究。在台灣，則此類研究仍然不多，且已有之研究常侷限於橫斷式或小規模樣本的資料。在此背景下，本研究計畫的主要目的，就是利用 TEPS 所得到代表台灣地區之大規模追蹤調查的資料，對於父母社經地位、教養方式及實際參與子女學習之作法等因素，如何影響其子女學習行為及成就做深入的研究。由於台灣社會同時受傳統文化及西方現代化的影響，有其特殊之社會文化背景。因此，本研究計畫之發現，當可與主要是在西方社會文化環境下發展出之理論及研究發現對話。

二、研究目的

本研究計畫為兩年期的計畫。這兩年內利用 TEPS 2001 年及 2003 年兩波調查資料，分別進行以下之研究議題：

- （1）第一年度（96 年度）的主要研究重點是瞭解父母社經地位與其教養方式的關係為何。在此議題下，本研究計畫利用 TEPS 兩波的資料中與父母教養方式有關之題項，整理分析出國、高中學生父親與母親各自的教養方式類型，並瞭解這些類型與家庭社經地位間的關係。
- （2）在前一議題研究的基礎上，本研究計畫第二年度則進一步探討社經地位、教養方式及作為，以及青少年學習行為及成就三者間的因果關係。此外，本研究進一步探索父母參與子女學習的實際作為與青少年學習行為及成就間之關係，是否會受到社經地位及教養方式的影響而有不同程度之關係。

就前述第一個議題言，雖然在國內外均已有多人研究，但以國內言，目前仍未有足以代表全台灣地區國高中生的樣本來檢證，也未能利用長期追蹤的資料來進一步釐清因果的

關係。第二個議題則不論在國內外均為剛開始受注意的議題。

三、文獻探討

3.1 教養方式與作為

父母教養方式與子女之心智及社會發展間關係是一向是心理學及社會心理學的重要研究課題。近半世紀來，不論是在理論上或研究方法上，心理學者對此課題的研究已有相當成就。在理論概念上，長期以來，學界所討論之教養行為常將較廣泛之教養方式 (parenting styles) 及較具體之教養作為 (parenting practices) 相提並論。因此，Darling 與 Steinberg (1993) 在回顧近年來此方面主要研究文獻後，將父母的教養行為區分成教養方式 (parenting styles) 與教養作為 (parenting practices) 這兩個概念 (另見 Holmbeck et al. 1995)。教養方式是跨情境的教養行為，是獨立於特定之親子互動情境的，且不一定有特定的社會化目標。父母透過教養方式傳達他們對子女的廣泛態度 (如管教子女時的身體語言或情緒等表現)。子女是透過不同情境之教養行為，來推斷父母對他們的情感態度。因此，父母教養方式提供了親子情感與互動的環境脈絡。

相對而言，教養作為是父母在特定社會化目標引導下 (如子女之學業表現)，所採取之管教措施與作為 (如參與子女之學校活動)。至於，教養方式與教養作為間的關係，有學者認為教養作為是教養方式對兒童或青少年發展影響之間的中介機制 (Majorbanks 1996)。Darling 與 Steinberg 則認為前者並不僅是透過後者而產生影響力，而且是對教養作為與青少年發展結果間關係，具有一種調節性的影響力 (moderating influence)。更具體的說，父母與子女間或有同樣頻率的互動及溝通行為，但在不同父母的管教方式下，其互動或溝通的方式、內容及性質卻可能大不相同 (另見 Pong et al. 2005)。

3.2 教養方式

在教養方式類型研究方面，最重要的基礎可說是建立在美國心理學者 Diana Baumrind 於 1970 年代的研究上。Baumrind 早期在觀察美國中產階級父母教養其學齡前幼兒後，建構出三種教養方式類型—民主權威 (authoritative)、獨裁專制 (authoritarian)，與寬鬆放任 (permissive) (Baumrind 1971)。這三種教養方式反映出父母在社會化子女過程中，對於子女在價值觀與行為標準的不同期待。此三種教養方式包括了父母對「要求」(demandingness) 及「回應」(responsiveness) 子女等兩個重要面向 (Darling and Steinberg 1993)。Darling 與 Steinberg (1993: 492) 認為前一面向的意義是：父母是否願擔負起社會化子女的責任，傳遞社會對子女的要求。而後一面向則是父母是否認可子女的個人性 (individuality)，瞭解子女對社會的要求。

民主權威型教養方式的特色是，父母期待子女有成熟的行為表現，因此會對子女設定明確的行為標準，並能執行對這些標準的要求，必要時也會以命令方式要求子女服從或給予懲罰。但採此教養方式的父母，也會鼓勵子女有獨立及個人化的表現，並能夠與子女溝通，說明父母之規定或懲罰之理由，或回應及支持子女的要求。因此，採此類型教養方式的父母在親子互動過程中，會考量親子雙方的權利與觀點，對於子女有相當程度的需求與回應。採專制獨裁型教養之父母，則是以父母的觀點及權威為親子互動過程的基礎。此類父母企圖以父母的標準來控制形塑子女的行為。父母期待的是子女服從、尊重權威。此類父母往往限制子女對父母要求的回應，也不期待與子女溝通。因此，此類型教養方式的父母對子女有高度的要求，但對子女回應的程度則相當低。至於，寬鬆放任型的父母，則是

相當容忍子女的衝動行為，也不太會處罰子女，也不要求子女有成熟的表現。換言之，採此類型教養方式的父母，是以子女的觀點為親子互動的基礎，對子女有相當高程度的回應，且要求子女的程度低。

Baumrind 在其最近對青少年發展適應的研究中，將原先的三個類型進一步細分為七個類型(Baumrind 1991)。但目前學界最常使用的教養方式類型是依據 Macoby 與 Martin(1983) 所發展出來的。根據 Baumrind 之分類及其他學者相關的理論及研究，Macoby 與 Martin (1983) 進一步的明確提出教養方式可在前述父母要求與回應的兩個面向基礎上，依據每一面向的高低程度，將教養方式區分為四類。除了與 Baumrind 相似的三類外，Macoby 與 Martin 認為尚可區分出忽視冷漠型之父母教養方式。此類型父母，與寬鬆放任型不同的是，他們不僅不擔負社會化子女的責任，與子女的關係也相當疏離，並不會回應子女的需求。

不論是如何分類，在從事教養方式之類型之研究時，有幾個需要進一步研商的議題。首先，如 Darling 與 Steinberg(1993)指出，Macoby 與 Martin 的分類雖然接近原先 Baumrind 之類型，但兩者的建構類型的取向並不同。Baumrind 建構類型的取向是採特定組態式 (Configurational)，其每一個類型之建構是除了前述的兩個主要面向外，每一類型中還有觀察資料所得之其他在情感與行為方面的特性（如心理控制、語言溝通等）。而 Macoby 與 Martin 則是著重在各種教養方式所共有的面向。雖然此取向的分類比較容易從事量化研究的測量與比較，但利用此種取向所得到的分類從事實證研究時，可能會忽略了不同類型的實質差異，可能不只在共同面向上有所差異而已，也在其他特性有所差異，進而可能無法解釋一些資料分析時所發現的一些現象 (Darling and Steinberg 1993: 492)。

此外，由於這些類型的建構是以美國中產階級社會的樣本為研究對象，因此在此一特定社會文化背景下所發現之面向與類型，是否能適當涵蓋其他社會文化背景下之父母教養行為，也非毫無問題 (Chao 1994; Stewart and Bond, 2002)。支持這些質疑最明顯的證據，就是於在比較同一社會中不同次文化群體或不同社會的父母教養方式時所碰到的問題。這類研究的發現是，如果依據 Baumrind 或 Macoby 與 Martin 的分類進行研究時，亞洲地區或歐美地區亞裔的父母與歐美地區非亞裔的父母相較下，亞洲地區或亞裔的父母以獨裁專制方式來教養青少年子女的比例比較高，但此方式對子女心理或智能發展的影響力卻不同於非亞裔的子女（見 Chao and Tseng 2002 之文獻回顧）。Chao (1994) 即認為亞裔青少年的父母雖然是比其他族群父母傾向於獨裁專制的教養方式，但在當其族群文化是比較強調相互依賴、家庭和諧及集體目標時，父母對子女的比較嚴格的管教，並不會使亞裔子女將此看成是父母對其的敵意，而反而會視為是對他們的關心。這與歐美主流社會強調個人獨立自主及平權的文化脈絡下，青少年傾向將父母施展權威，視為是一種具有敵意的行為是相當不同的。

有鑑於此，Stewart 與 Bond(2002)建議將教養方式及教養作為的概念及其測量做區分。教養方式的測量，應該比較抽象或跨越情境的。由於教養方式的各個面向，比較是跨情境的，因此其意義與影響力或許比較能夠跨社會文化。例如，比較回應子女的父母，由於子女能感受父母的溫情與愛護，子女會比較接受並認同父母。反之，高壓控制的父母，不論是在哪個社會，對子女的影響可能都是比較負面的。而具體教養作為的意義及影響力與教養方式間的關係，則是會隨社會文化而不同。此外，雖然面向的意義或影響力是比較跨社會文化的，但依照這些面向所組合的類型，卻又可能不能廣泛適用在不同的社會中。因此，

他們建議在其他社會從事教養方式之研究時，應該是先探索各個面向之個別影響力，而非一開始就用組合後的類型來研究。據此，本研究計畫也是採取這個建議從事教養方式對學習成就影響力的研究。

過往研究父母教養方式之類型與面向時，也常忽略了父親與母親間可能有的差異。在一般教養方式的研究中，常常是只以母親的教養方式或作為為主，而忽略了父親教養的角色。雖然一些研究顯示，近年來，父親參與子女照顧與教養的時間逐漸增加，但父親仍然是以扮演著提供家庭經濟資源的工具性角色為主，而較少時間與子女互動，或直接參與子女日常的教養(Pleck 1997; Parke 2002)。當父親參與青少年子女教養時，青少年的知覺是，父親會比母親嚴格，也比較不接納子女的要求(Pipp et al. 1985; Youniss and Smollar 1985)，或者父親在要求或回應上都比母親來的低(Paulson and Sputa 1996)。但一般言，父親參與教養子女時，父親對子女的發展是有別於母親之獨立影響力(Pleck 1997; Parke 2002)。因此，在實證研究時，如果有父親教養子女的資料時，應可分別檢視父母親教養方式及作為的影響力。但更重要的是，子女在有雙親家庭的環境中，是同時面對父母的管教。父親與母親的教養方式，有可能是由一方主導教養，也可能是雙方均參與教養。如果是父母均參與建構教養的環境，則兩者的教養方式有可能是一致或不一致。因此，研究者應設法捕捉這樣的教養情境。但是過往在這方面的研究，不論國內外，都是相當缺乏的。

3.3 社經地位與教養方式的關係

雖然學者認為父母社經地位會影響到其教養方式，但目前研究這兩者間關係為焦點的實證研究並不多(見 Hoff et al. 之文獻回顧)。在此方面大多之研究是在研究父母教養方式對子女發展結果的影響時，將社經地位看成是必須的控制變項。即便如此，如 Dornbusch 等人(1987)研究即發現，父母教育程度比較高的，比較傾向採用民主權威的方式。教育程度低的父母，則較會用獨裁專制或寬鬆放任的方式。Chen 等人(1997)在中國大陸以小學生為樣本的研究，也有同樣的發現。如前述，一般的研究發現是，亞洲地區青少年的父母比較傾向採取獨裁專制的教養方式。因此，在台灣社會中，父母社經地位是否在教養方式上有顯著的關連或差異，是一值得探討的議題。

目前比較多的研究是在父母社經地位與教養子女之價值觀，參與子女學習作為，以及貧窮對家庭過程及子女發展的影響等。長期以來，對於父母價值觀如何影響其教養方式與作為，最主要的依據是 Kohn (1969) 的調查研究結果。Kohn 的研究是著重在職業與教養價值間的關係。Kohn 的主要發現是中產階級的父母，比較重視子女發展出依循內在行為標準之自我導向(self-direction)特質；勞工階級者，則比較強調子女對外在權威的服從。由於強調的教養價值不同，中產階級的父母在處罰子女時，會比較重視其行為的動機，也不傾向用外在控制的體罰方式，子女表現好時，則會稱讚他們。而勞工階級父母，則傾向用體罰的方式，且必較不會稱讚子女。

Kohn 將此教養價值上的差異歸因於父母所從事之工作的環境。簡言之，中產階級所從事的工作比較複雜，常無法依照一定的程序行事。因此，從事此類工作者，就比較獨立作業，並須自我監督負責。反之，勞工階級所從事的工作，屬於比較單純、例行化，且受他人嚴格監督。因為這種教養價值的不同，父母也就在(亦見 Kohn and Schooler 1983)。Kohn 的這些觀察，在後來的研究者得到相當程度的支持，如 Luster 等人(1989)進一步的證實了教養價值與教養行為間的關係，Wright and Wright (1976)則發現除了家長職業外，教育

程度對教養價值之關係可能更大。Kohn 的發現也在包括台灣在內的不同社會之調查研究中，得到相當程度的支持（如瞿海源 1991；黃毅志 1999；Kohn et al. 1983，Ma and Smith 1990；Pearlin and Kohn 1966）。

雖然，Kohn 的觀察得到相當多的支持。但也有研究者提出，由於父母的教育程度對教養行為的影響相當大，在工業化社會中，整體社會教育程度逐漸提高的情況下，父母社經地位在教養子女行為上的差異，也日趨減小（Alwin 1984）。黃毅志（1999：197）根據其在台灣地區的研究發現，也有類似的看法。此外，最近一項台灣的研究也發現，雖然高社經地位的父母會重視子女的一些價值取向，如重視好奇心等，但卻對自律或順從這類的價值觀沒有影響（Yi et al. 2004）。這些不一致研究發現，說明了目前仍然有研究社經地位與一般教養作為間關係的必要性。

3.4 小結

從以上的文獻回顧來看，對於父母社經地位與教養方式，研究者可以提出：父母社經地位越高者、其教養方式會越傾向對青少年子女要求程度高與回應子女程度高的民主權威型教養方式。此外，由於過往研究的不足，父親與母親在教養方式有何差異，且是否會隨家庭社經地位的不同而不同，則是須要進一步研究的議題。

四、研究方法

4.1 資料來源

本研究計畫將申請使用目前已釋出之第一、二波「台灣教育長期追蹤資料庫」之國高中職五專公開版的資料。使用之資料包括了由學生問卷及家長問卷所得到之相關資料。

TEPS 是依照城鄉分佈、公立/私立等，以分層隨機抽樣方式進行國高中職五專學生樣本的抽樣。其抽樣設計是先抽出學校，再抽出班級，每班再隨機抽出至少 15 名學生。依據 TEPS 網站所公布有關樣本方面之訊息，第一波調查收集了台灣地區共 39,337 名國高中職五專學生之資料。第二波調查為第一波抽樣學生的追蹤調查。完成調查的學生數共 37,277 人（請見 <http://www.teps.sinica.edu.tw/introduction.htm>）。

使用這兩波國高中職五專生資料的原因有二：（1）第一波資料中有關父母教養方式的題項比較有限，第二波則有比較多的題項是與父母教養方式有關。本研究計畫的目的之一，是透過第二波資料中與教養方式有關的題項，來瞭解第一波資料中與教養方式相關題項之意義。（2）在達成前項之目的後，本研究計畫將可進行計畫所欲探討的實質議題。由於父母的教養行為可能因子女的學習表現或發展階段而做調整，因此此類議題的研究最好是使用追蹤調查的資料。此外，本計畫目的之一，是瞭解在青少年不同之學習階段，父母社經地位，教養行為與子女學習表現間的關係是否不同。因此，本計畫須使用國高中職五專兩個學生樣本的資料。

此外，因本研究所關心的主要議題之一是同時考量父親與母親所建構之共同教養方式，因此本研究將分析樣本限制在有雙親的家庭（即回答與父母同住者）。

4.2 研究測量與分析方法

本計畫所關注之主要變項，在學生問卷及家長問卷可以得到的包括（參見

- A. 父母社經地位：在家長問卷中有父親及母親之教育程度，職業、全家每月平均收入等。
- B. 與父母教養方式有關的變項：在第一波學生問卷中相關的題項有父親/母親是否能接納學生，及父親/母親是否管教嚴格。第二波學生問卷中，則有更詳細之家中長輩教養行為的題項。其中包括父母（或家中其他人）自受訪學生上國中或高中以來，是否會對受訪學生做以下的事（見附錄 1 及附錄 2）：
- a. 明確要求生活作息
 - b. 嚴格管如何用錢
 - c. 管功課
 - d. 明確要求言行舉止及服裝儀容
 - e. 明確要求飲食或健康習慣
 - f. 嚴格管交朋友的事
 - g. 會經常告訴不要傷父母的心或做讓父母丟臉的事
 - h. 在管教時，不准插嘴或回嘴
 - i. 會一叫做事，就得馬上做不能延誤
 - j. 會為了一點小事，動不動就大罵
 - k. 會為了一點小事，動不動就打
 - l. 平常在家裡會認真聽（你的）想法、（和你）溝通
 - m. 經常拿兄弟姊妹或別人家的子女做比較
 - n. 不太放心、經常一再重複叮嚀
 - o. 和你相關的事，通常由誰來做決定
 - p. 對新的想法或嘗試潑冷水
 - q. 不論是什麼東西或事情，當（你）想要時總是會答應要求
 - r. 誰很能接納
 - s. 誰管教頗為嚴格

以上這些題項的答項是：沒有人會如此、爸爸、媽媽、（外）祖父、（外）祖母、家中其他人。

由於 TEPS 抽樣之特殊性，本研究將使用 Stata 及 Mplus 等統計軟體來進行分析之工作。Mplus 之軟體可以從事包含具有等級尺度之潛在變項，以及多變項線性模型分析於同一模型分析中。由於本計畫所研究之教養方式與作為，是以類別或等級尺度（從來沒有、偶爾有、有時有、經常有）來測量。以往由於統計軟體工具的限制，往往只能忽略變項的屬性，直接以連續變項（continuous variable）的方式處理，或忽略變項內容可能涉及不同層面的問題，將所有變項加總後，再以連續變項的方式處理。但這些作法常會造成模型估計上的誤差。近幾年來，潛在變項（latent variable）方面的研究蓬勃發展，已經可以讓研究者在軟體中直接將應變項或指標變項（indicator variable，用以估計潛在變項的值）定義為等級或類別尺度變項，並以等級或類別尺度變項的方法估算其潛在變項的值，再將後者作為分析模型實際的應變項。在一個模型裡，研究者可以依據理論架構的需要，集結數個等級尺度變項作為一個或數個潛在變項的指標變項，並以其他預測變項探索其與潛在變項之間的關係；無須擔心累積偏誤（aggregate bias）的問題，不必再將就統計軟體的限制，也無須擔心因軟體限制而對模型的估算產生影響。此外，由於是利用兩波的資料在同一模型內，Mplus 也可以處理兩波變項間測量會有相關的問題。

五、第一階段研究之發現

本研究第一階段先依據 TEPS 公開釋出的第二波國中及高中職五專資料中與教養方式有關的變項，分別進行父親與母親之教養方式類型的探索研究。

5.1 國中樣本之父母親教養方式

第二波 TEPS 國中公開釋出樣本的總數為 13,247 人。排除其中無父親或母親，以及回答父母親教養方式相關的 18 個題項（4.2 節所列 a 至 q）與第一波回答父親及母親是否接納及管教嚴格四個題項中不合理值或遺漏值者後，可分析的樣本為 10,233 人，占原來樣本的 77.2%。

由於母親通常是最主要在家庭管教子女者，因此，分析的步驟是先以 Mplus 對母親教養方式有關的各題項分別作探索性之因素分析（exploratory factor analysis, EFA），然後再根據理論概念面向檢視其結果後，再進行驗證性因素分析（confirmatory factor analysis, CFA），最後則是與父親教養方式有關的探索及驗證。進行因素分析時，所有這些題項的回答中若選擇父親或母親者，則分別過錄為 1，否則過錄為 0。經探索性因素分析，並經 varimax 法轉軸後的結果顯示，如選取因子的標準為特徵值（eigenvalue）大於 1 者，則在母親教養方式方面，18 個變項可得到三個因子或潛在變項，其累積變異解釋量為 53.27%。此三因子模型的適配度（goodness of fit）以 RMSR（ROOT MEAN SQUARE RESIDUAL）為 0.0339，可符合一般小於 .05 之要求。表 1 進一步呈現出此三因子與原各變項間的因素負荷量。由 EFA 的結果可看出，第一個因子的實質意義是與對子女行為的嚴格管教有關，第二因子則是傾向為與嚴厲教養有關，第三因子則為與對子女之支持與回應有關。整體言，此三因子除第一因子及第三因子符合原先文獻所討論之教養方式的要求與回應兩面向外，尚有一與嚴厲教養有關的面向。此外，第一因子中上包括了母親告訴子女不要傷父母的心或作讓父母丟臉的事，以及不放心子女、一再叮嚀的指標。此一指標顯示，母親嚴格管教子女不僅在是透過外在行為的管控，也透過心理層面的管控，如羞恥心。而母親會嚴格管教者的潛在原因之一，則是將子女當成小孩看待，且不放心子女能夠完全自主。

由於本研究計畫的樣本數相當大，且為了能簡化因素的結構，因此，本計畫先排除因素負荷量低於 .5 的指標，然後再從事驗證性因素分析。經此步驟後，共保留了 14 個指標，其中與第一因子相關之指標包括：明確要求作息（W2S2013）、嚴格管如何用錢（W2S2023）、管功課（W2S2033）、明確要求言行舉止及服裝儀容（W2S2043）、明確要求飲食或健康習慣（W2S2053）、嚴格管交朋友的事（W2S2063）、經常告訴不要傷父母的心或作讓父母丟臉的事（W2S2073）、不太放心，一再重複叮嚀（W2S2143）等。保留為第二因子的指標則為：一叫做事不得延誤（W2S2093）、為了一點小事，動不動就大罵（W2S2103）、為了一點小事，動不動就打（W2S2113）、對新想法或嘗試潑冷水（W2S2163）。與第三個因子有關的兩個的指標——平常在家會認真聽你的想法、和你溝通（W2S2123）、碰到重大問題或挫折時，會特別撥出時間來幫助你（W2S2183）——則都保留。

利用保留後的指標驗證性因素分析的結果顯示，這三因子的模型也有相當良好的適配度（見表 2），且各因子對各指標的解釋力大多在 .4 以上（見表 3）。本研究進一步將母親教養方式的因素結構，做為 TEPS 第二波國中學生樣本之父親的驗證性因素分析的基礎。其結果也有良好的適配度（見表 4），且各因子對各指標的解釋力大多在 .4 以上（見表 5）。

本研究也進一步檢視此處所得到之父母親的教養方式的三個因子與第一波及第二波國中樣本詢問其父母親是否能接納及嚴格管教受訪者等題項間的關係。第一波的問法是分別詢問學生父親或母親是否很能接納，以及對其管教是否頗為嚴格。答項則分為「非常符合」、「符合」、「不符合」及「非常不符合」等四個。第二波的問法則為同樣的題項，但答項則為複選。使用 Mplus 以各變項之測量尺度進行相關的結果呈現在表 6。這些相關原則上均符合預期，如與嚴格管教或嚴厲教養方式的因子（表 6 之 F1 及 F2）均與第一、二波受訪者認為父或母符合管教嚴格的答項成正相關。反之，與管教方式能支持回應子女的因子(F3)則與接納的題項成正相關。表 6 也顯示第一波回答父或母親接納者，與第二波認為父或母親為嚴格管教者的相關為負。換言之，兩波間的回答有一定程度的穩定性。此處的研究發現也支持這兩波以比較簡單的方式詢問學生父母是否接納或管教是否嚴格的題項，可以視為是父母親教養方式比較粗略的測量方式。

5.2 高中職五專樣本之父母親教養方式

第二波 TEPS 公開釋出之高中職五專樣本的總數為 12,711 人。排除其中無父親或母親，以及回答父母親教養方式相關的 18 個題項（4.2 節所列 a 至 q）與第一波回答父親及母親是否接納及管教嚴格四個題項中不合理值或遺漏值者後，可分析的樣本為 10,591 人，占原來樣本的 83.3%。

分析高中職五專樣本父母親教養方式的步驟與國中樣本相同。首先對母親教養方式進行 EFA 後，得到與國中樣本非常相近的因子結構（見表 7）。18 個高中職五專學生之母親教養方式的變項也可以三個潛在因子來解釋，其累積變異解釋量為 55.11%。與國中樣本的結果比較，高中職五專生的 EFA 分析結果只有在第二因子方面有些不同。表 7 顯示此第二因子多了一個因子負荷量大於.05 的指標，即「誰會在管教你的時候，不准你插嘴或回嘴」。再進一步用 CFA 對 15 個因子負荷量大於.05 的指標作分析後（見表 8），發現其模型適配度並不如國生樣本理想，其 RMSEA 值為.061。雖然此數值屬於可以被接受的範圍（MacDonald & Ho, 2002），但經更進一步以與國中生同樣的模型從事 CFA 分析後（亦即將第二因子多出之指標去除後），模型適配度獲得改善，RMSEA 達到小於.05 的理想範圍內（見表 9），且各因子對各指標的解釋力大多在.4 以上（見表 10）。

利用保留後的 14 個指標進行 TEPS 第二波高中職五專學生樣本之父親的驗證性因素分析的結果，也有良好的適配度（見表 11），且各因子對各指標的解釋力大多在.4 以上（見表 12）。

5.3 家庭社經地位與父母親教養方式之關係

本研究計畫之研究目標之一為了解家庭社經地位與父母親教養方式間關係為何。不論是國中或高中職五專樣本，本計畫將家庭社經地位（SES）視為一潛在變項，並以父母親教育程度較高者，家庭每月總收入，以及父母親職業技能等級較高者為指標。不論是國中或高中職五專生的樣本，此 SES 的模型適配度均良好。

本研究進一步檢視 SES 分別對父母親教養方式的影響，並以性別做為控制變項，一併利用 Mplus 進行分析。國中樣本的結果呈現在表 13 至表 16，高中職五專樣本的結果為表 17 及表 20。如研究假設所預期的，不論是國中生或高中職五專生樣本，當家庭社經地位較

高時，母親比較不嚴格管教子女行為，而比較傾向支持及回應子女的要求，但在嚴厲教養方式上，則與社經地位無關（見表 14 及表 18）。但是父親教養方式則國高中生有所不同。表 16 顯示，社經地位越高的國中生家庭，父親只有在支持回應的面向上會顯著較高，在嚴格及嚴厲管教上則無差異。但在高中職五專階段，父親社經地位越高者，則在嚴格、嚴厲及支持回應三個管教面向均增加。前二者與研究假設預期是相反的。這個發現也與國外發現父母對青少年的管教會逐漸傾向讓青少年自主不同（Paulson & Sputa 1996）。但是這是否是因為父親本身的行為改變，還是高中職五專對於父親管教行為的知覺上的變化，則仍需作進一步的探究。

六、第二階段之研究發現

本計畫第二階段是依據第一階段研究發現的基礎上，進一步檢視家庭社經地位、父母親共同教養方式的類型、參與子女學習的教養作為之間的關係，以及這些因素對於子女學習成就的影響。其分析方法仍分別就國中及高中職五專樣本，以 Mplus 進行父母親共同教養方式的類型，以及參與子女學習的教養作為之探索性及驗證性的因素分析，然後結合家庭社經地位之潛在變項，以及第二波的綜合能力分析分數為依變項，進行結構方程模型（structural equation modeling，SEM）的分析。

6.1 國中樣本之父母親共同教養方式

本階段分析的對象是將國中生完整回答此階段研究所需之各項題目者，樣本數是 9,392 人。依據第一階段所選出之建構父親與母親教養方式的各項指標變項，本階段研究進一步探索父母共同教養方式的類型。由於本階段要進一步瞭解父母教養方式與參與子女學習間的關係，因此探索共同教養方式的面向時，並未納入父母是否會嚴格管功課此項指標。

本階段研究也是先經探索性因素分析後，再進行驗證性因素分析。驗證性因素分析的結果呈現在表 21 至表 23。表 21 顯示經驗證性因素分析後，國中生所知覺到的父母教養方式可以分成五個面向，其中四項與父親或母親明確要求遵守各項行為常規，以及與嚴厲教養有關。而此四項中又可區分是明顯以父親為主導者，以及明顯以母親為主導者的各有兩項。不論是父親或母親為主導，明確要求的常規都是在作息、言行舉止及服裝儀容，以及飲食或健康習慣等項目。嚴厲管教的指標則均是為小事打或罵、要求做事不得延誤，以及對新想法或嘗試潑冷水等。另一項父母共同教養的面向則是父母對子女都會給予支持及回應，其指標包括認真聽子女想法，以及撥時間幫助子女面對重大問題或挫折等。表 22 及表 23 則顯示不論是整體模型適配度，或個別潛在因子對相對應指標的解釋程度，這五個潛在因子均相當程度反映了資料的潛在結構。

此五個潛在因子所反映之父母共同教養方式與第一階段所發現父親及母親各自的教養方式面向一致性頗高，為一明顯的不同是父母親對子女的支持與回應，在此階段研究發現是不能分開為父親或母親各自教養方式的因子。

6.2 國中樣本父母親參與子女學習的教養作為

本階段研究分別檢視父親與母親具體參與子女學習的教養作為是否可成為一潛在變項，以便瞭解其與較廣泛之父母教養方式間的關係為何。探索及驗證父親及母親此一教養作為的六個指標變項是來自 TEPS 第一波學生問卷的題項。這些指標包括父親及母親會不會與受訪學生談升學或就業的事情（TEPS 變項編號：w1s219、w1s223），會不會看受訪學

生的作業或考卷，瞭解其學習情況（TEPS 變項編號：wls221、wls225），以及會不會參加受訪學生學校的活動，或擔任家長會委員或義工（TEPS 變項編號：wls222、wls226）。這些題項的答項是「經常會」、「有時會」、「偶而會」及「從來沒有」。

表 24 及表 25 顯示不論是整體模型適配度，或個別潛在因子對相對應指標的解釋程度，父親及母親參與子女學習的教養作為均可分別視為是一個潛在變項。在以下進一步分析教養方式及教養作為對學習成就之影響時，本研究會進一步檢視此二因子做為一個二階因子的指標，以瞭解父母共同參與子女學習的教養作為對學習成就的影響為何。

6.3 以綜合能力分數為依變項之結構方程模型

本研究計畫最主要的目的是瞭解父母社經地位對父母教養方式及參與子女學習的教養作為的影響，以及這三者對子女學習成就的影響為何。由於父母教養方式是可視為是獨立於特定之親子互動情境的，且無特定社會化目標的教養行為。而參與子女學習的教養作為則可視為是在特定社會化目標引導下，所採取之管教措施與作為。因此，此階段的研究將教養作為當成是介於教養方式與學習成就的中介變項，以檢視不同教養方式是否會影響其參與子女的教養作為，並進一步檢視二者與學習成就的關係為何。

由於 TEPS 蒐集父母教養方式有關的指標變項是在第二波，因此本研究以國三時的綜合能力分數為依變項，進行整體結構方程模型的驗證。

6.3.1 以國三綜合能力分數為依變項之結構方程模型 A

本研究檢視兩種以國三綜合能力分數為依變項的結構方程模型。圖 1 顯示的是將父母參與學習的教養作為視為一個二階因子的結構模型 A。此二階因子也就是父母共同參與子女學習的潛在變項。其分析結果呈現在表 26 及表 27。表 26 顯示結構模型 A 整體的適配度大致是在可接受的範圍。表 27 則進一步呈現結構模型 A 之各潛在變項間的關係。從結構模型的係數估計可看出，國中生的父母社經地位越高者，父親及母親都越可能對子女的行為有明確的常規要求，也越可能與子女溝通，瞭解子女的想法。父母社經地位越高者，也越會參與及關心子女的學習情況。但是社經地位與父母是否會嚴厲管教則無關。此外，父母社經地位月高者，對於國三子女的學習成就會有不透過教養方式或作為的直接正面影響。

在父母教養方式與其參與子女學習的教養作為的關係上，表 27 顯示父親與母親對子女有明確常規要求者，以及父母會支持回應子女者，比較會有參與子女學習的行為，而會嚴厲管教者與參與子女學習的行為間的關係是負向的，但並未達顯著（以估計係數除以標準誤接近 1.96,也就是 $p \leq .05$ 的顯著水準判斷）。但是如果進一步看各教養方式間的相關係數估計，則可看出父親或母親會明確要求子女遵守常規者，與其配偶採取明確要求子女遵守常規的行為有顯著且接近中度的正相關。但這類父母也與嚴厲管教的行為有顯著但低度正相關。另一方面，這類父母也比較可能會支持或回應子女。而父母如果嚴厲管教的程度，則與國中生知覺父母對他們的支持或回應之間有顯著但低度的負相關。

就父母教養方式及參與子女學習的教養作為對國三學習成就的影響觀之，則在其他條件相同的情況下，如父親對子女會明確要求常規者，其對子女的學習成就會有負面的影響。但母親有同樣教養方式者，則對學習成就無顯著影響。至於父母採嚴厲管教方式者，以係數觀之可能是負面的，但均未達顯著（父親採嚴厲管教方式的負面影響，如以 $p \leq .05$ 為顯

著水準，則是在達顯著度的邊緣)。另一方面，父母如果能與子女溝通，協助子女面對問題或挫折者，則會對學習成就有正面的影響。父母參與子女學習者，也會對子女學習成就有正面的影響。

綜合以上研究發現觀之，國中生的父親的教養方式與教養作為對子女學習成就的影響力會有矛盾的情況。一方面，父親如對子女嚴格要求遵守作息等常規的管教方式，對子女的學習成就會有負面影響，但另一方面，這類父親也比較可能關心子女的學習，而這種作為則對國三子女學習成就會有正面的影響。這種矛盾的情況，需要進一步將父親及母親參與子女的教養作為分別開來觀察，方能更清楚的瞭解。此外，此處的發現也顯示，母親只有在參與子女的學習時，才會對子女的學習成就有影響。

6.3.1 以國三綜合能力分數為依變項之結構方程模型 B

圖 2 顯示的是將父母參與學習的教養作為各自為一個因子的結構模型 B。其分析結果呈現在表 27 及表 28。表 28 顯示結構模型 B 整體的適配度大致是在可接受的範圍。表 29 則進一步呈現結構模型 A 之各潛在變項間的關係。表 29 呈現的結果大致與結構方程模型 A 的結果一致。由於模型 B 將父親及母親參與子女學習的教養作為分開考量，因此，此處討論的焦點是放在此父母社經地位及教養方式對此二項教養作為的影響，以及其對國三生學習成就的影響。

表 27 顯示父母社經地位越高者，不論是父親或母親也都越可能有參與子女學習的作為。同樣的，當父親或母親對其子女有明確常規要求時，也各自對自己參與子女學習的作為有正面的影響力，但有趣的是，父母這類教養方式會對配偶參與子女學習的作為有負面的影響。反之，當父親或母親有嚴厲教養的傾向時，則會對自己參與子女學習有負面影響，但卻對配偶的這類作為有正面影響。至於，父親及母親對子女學習的參與作為之間也會有中渡正面的相關，但只有父親參與子女的作為會直接對國三子女的學習成就有正面影響，母親的參與作為則無直接影響力。

由以上的研究發現觀之，父母參與子女學習的教養作為對子女學習成就的影響，主要是來自父親的參與。但同樣的，當父親對子女有明確常規要求時，其對子女學習成就的直接負面影響是與其比較可能參與子女學習的所形成對學習成就的正面影響力是相抵觸的。此種對學業成就的負面影響力，也可以透過對子女的支持與回應而被部份抵銷。綜合言之，就本研究的發現來看，父親對子女的教養方式與作為是相當複雜的。而母親明確要求子女遵守常規的教養方式一方面會直接正面影響子女的學習成就，另一方面，卻因母親此種教養方式會對父親的明確常規要求有正相關，進而使其對子女學習成就的影響會有些間接的負面作用，也會因此減少父親參與子女學習的作為，而減少父親這種作為可能有的正面影響。整體言之，就國中樣本而言，父親教養方式及作為對子女學習成就的影響力，不論是直接或是間接的影響力，都是大過母親的。

6.4 高中職五專樣本之分析結果

第二階段研究對高中職五專樣本的分析是建立在國中樣本之分析結果的基礎上進行的。從表 30 至表 34 所呈現的結果來看，高中職五專生父母的共同教養方式以及參與子女學習的教養作為，均與國中生樣本相似。兩個樣本有相似的結果，一方面說明了 TEPS 資料有相當高的信度，另一方面則說明了台灣中學生家長的管教行為及作為，不論是在青少年成長的那個階段，有其一定程度的穩定性。

由於國高中生樣本在教養方式及作為的驗證性因素分析結果類似，因此以下討論的焦點是放在以高三/專三綜合能力分析分數做為學習成就指標，以及整體結構方程模型的依變項的討論上。此外，由於國中樣本分析結果指出父親及母親的教養作為應該是分別開來看，因此，此處進一步將討論焦點放在表 35 所呈現之結構方程模型。

表 35 所顯示的結果與國中樣本有幾項明顯不同之處：

(1) 就父母社經地位對父母親教養方式及作為的影響而言，與國中樣本不同之處在於，高中職五專生父母的社經地位越高時，其父親越可能會對其子女使用明確常規要求及嚴厲管教等兩項教養方式，而對母親在這兩類相對應的教養方式雖都呈現是負面、但皆未達顯著的影響力。這結果或許說明了高中職五專生到此成長階段對於父親管教方式的知覺比較敏感。這現象或許是客觀反映了高社經地位父親可能較傾向不讓其子女更有自主性，但也可能是反映了高社經地位的子女對自主性的要求更高。

(2) 另一與國中樣本的分析結果明顯不同之處，在於母親如果是採取嚴厲管教方式的話，會對其高中職五專子女的學習成就有顯著負面的影響。但與國中樣本之分析結果相同的是，父親如採取嚴厲管教方式，則不會直接對學習成就有顯著影響。因此，對照前述高社經地位家庭的父親可能比較會採取嚴厲管教的傾向而言，父親的此種傾向似乎對子女學習成就不會有太大的直接影響。

(3) 表 35 也顯示，不論是父親或母親參與子女學習的作為都不會對子女的學習成就有直接的影響。這或許說明了高中職五專的父母在此成長階段，已經無法透過此種作為有效協助子女的學習。

六、計畫成果自評

此二年度研究計畫執行的成果大致上達成預期的目標。這些目標包括：

- 1、以 TEPS 資料分析出台灣中學生父母教養方式的類型，提供未來研究進一步進行相關研究的基礎。
- 2、具體回答了本研究關心的議題：
 - (1) 研究結果顯示台灣中學生父母的社經地位會影響其教養方式，以及參與子女學習的教養作為。其影響主要是在父母親是否會明確要求子女遵守作息、服裝儀容等常規，以及是否會支持回應其子女等面向。但是社經地位對父母教養方式及作為的影響，也會因子女成長階段的不同而有差異。
 - (2) 父親教養方式與母親教養方式對子女學習成就的影響力是不同的。本研究顯示父親對子女明確要求子女遵守常規與其對子女學習參與的作為間有矛盾的作用力。父母親教養方式也會對其配偶的教養作為有影響力。整體言，父親的教養方式及作為對子女學習成就的影響力大過母親，且父母的參與學習的教養作為對子女學習成就的影響力也會因子女成長階段不同而有差異。這些分析結果都是過往研究所未能發現的。

本研究計畫仍有待進一步探討的方向為：

- 1、在現有的基礎上發展出父母教養方式的類型。目前本研究的作法是將教養方式的不同面向視為一連續的潛在變項。是否能在此基礎上，進一步發展出適當的教養方式類型，是需要進一步的探索。本研究計畫的目標之一是瞭解教養方式是否可成為參與子女學習之教養作為的調節變項。如能分析出教養方式的類型，對於這種探索會比以用連續性的變項較有利。
- 2、本研究是利用 TEPS 最早蒐集的兩波國高中資料從事分析。未來應進一步利用自 2001 年起持續追蹤至 2007 年的核心追蹤樣本來檢視本研究所關心的議題，以進一步瞭解父母對子女教養方式的變化，以及教養方式及作為對學習成就間的因果關係。

七、參考文獻

黃毅志，1999。社會階層、社會網絡與主觀意識。台北：巨流。

瞿海源，1991。社會心理學新論。台北：巨流。

Alwin, Duane F.. 1984. "Trends in Parental socialization values: Detroit, 1958-1983." *American Journal of Sociology* 90: 359-382.

Anderson, Kathleen E., Hugh Lytton & David M. Romney. 1986. "Mothers' Interactions with Normal and Conduct-Disordered Boys: Who Affects Whom?" *Developmental Psychology*, 22, 604-609.

Baumrind, Diana. 1971. Current Pattern of Parental Authority. *Developmental Psychology Monograph*, 4 (1, Part 2).

Baumrind, Diana, 1991. "Parenting Styles and Adolescent Development." Pp. 746-762 in *Encyclopedia of Adolescence*, edited by R. Lerner, A. C. Petersen, J. Brooks-Gunn. New York: Garland.

Baumrind, Diana and Allen E. Black. 1967. "Socialization Practices Associated with Dimensions of Competence in Preschool Boys and Girls." *Child Development* 38: 291-327.

Bell, Richard Q.. 1968. "A reinterpretation of the Direction of Effects in Studies of Socialization." *Psychological Review*, 75, 81-95.

Bell, Richard Q. and Michael Chapman. 1986. "Child Effects in Studies Using Experimental or Brief Longitudinal Approaches to Socialization." *Developmental Psychology*, 22, 595-603.

Campbell, Jay R., Catherine M. Hombo, and John Mazzeo. 2001. *NAEP Trends in Academic Progress: Three Decades of Student Performance*. (NCES 2000-469). Washington DC: U.S. Department of Education.

Chen, Xinyin, Qi Dong, and Hong Zhou. 1997. "Authoritative and Authoritarian Practices and Social and School Performance in Chinese Children." *International Journal of Behavioral Development* 21: 855-873.

Chao, Ruth K.. 1994. "Beyond Parental Control and Authoritarian Parenting Style: Understanding Chinese Parenting Through the Cultural Notion of Training." *Child Development* 65: 1111-1119.

Chao, Ruth and Vivian Tseng. 2002. "Parenting of Asians." Pp. 59-93 in *Handbook of Parenting, Vol. 4: Social Conditions and Applied Parenting*, edited M. H. Bornstein. Mahwah, NJ: Lawrence Erlbaum Associates.

Coleman, James S.. 1988. "Social Capital and the Creation of Human Capital." *American Journal of Sociology* 94: 95-120.

Collins, W. Andrew, Michael L. Harris, and Amy Susman. 1995. "Parenting During Middle Childhood." Pp. 65-89 in *Handbook of Parenting, Vol. 1: Children and Parenting*, edited M. H. Bornstein. Mahwah, NJ: Lawrence Erlbaum Associates.

Conger, Rand D., Xiaojia Ge, Glen H. Elder, Jr., Frederick O. Lorenz, and Ronald L. Simons. 1994. "Economic Stress, Coercive Family Process, and Developmental Problems of Adolescents." *Child Development* 65:541-561.

Conger, Rand D., Vonnie C. McLyod, Lora Ebert Wallace, Yumei Sun, Ronald L. Simons, Gene H. Brody. 2002. *Economic Pressure in African American Families: A Replication and Extension of the Family Stress Model*. *Developmental Psychology* 38: 179-193.

- Darling, Nancy and Laurence Steinberg. 1993. "Parenting Style as Context: An Integrative Model." *Psychological Bulletin* 113: 487-496.
- Dika, Sandra L. and Kusum Singh. 2002. "Applications of Social Capital in Educational Literature: A Critical Synthesis." *Review of Educational Research* 2002: 31-60.
- Dornbusch, Sanford M., Philip L. Ritter, P. Herbert Leiderman, Donald F. Roberts, and Michael J. Fraleigh. 1987. "The Relation of Parenting Style to Adolescent School Performance." *Child Development* 58: 1244-1257.
- Epstein, Joyce L.. 1996. "New Connections for Sociology and Education: Contributing to School Reform." *Sociology of Education Extra Issue*: 6-23.
- Erickson, Rebecca J. and Viktor Gecas. 1991. "Social Class and Fatherhood." Pp. 114-136 in *Fatherhood and Families in Cultural Context*, edited by F. W. Bozett and S. M. H. Hanson. New York: Springer.
- Fan Xitao and Michael Chen. 2001. "Parental Involvement and Students' Achievement: A Meta-Analysis." *Educational Psychology Review* 13: 1-22.
- Gamoran, Adam. 2001. "American Schooling and Educational Inequality: A Forecast for the 21st Century." *Sociology of Education*, 74 (Extra Issue): 135-153.
- Glasgow, Kristan L., Sanford M. Dornbusch, Lisa Troyer, Laurence Steinberg, and Philip Ritter. 1997. "Parenting Styles, Adolescents' Attributions, and Educational Outcomes in Nine Heterogeneous High Schools." *Child Development* 68: 507-529.
- Gray, Marjory Roberts and Laurence Steinberg. 1999. "Unpacking Authoritative Parenting: Reassessing a Multidimensional Construct." *Journal of Marriage and the Family* 61: 574-587.
- Guo, Guang and Kathleen Mullan Harris. 2000. "The Mechanisms Mediating the Effects of Poverty on Children's Intellectual Development." *Demography* 37: 431-447.
- Hill, Nancy E., Domini R. Castellino, Jennifer E. Lansford, Patrick Nowlin, Kenneth A. Dodge, John E. Bates, and Gregory S. Pettit. 2004. *Child Development* 75: 1491-1509.
- Hoff, Erika, Brett Laursen, and Twila Tardif. 2002. "Socioeconomic Status and Parenting." Pp. 231-252 in *Handbook of Parenting, Vol. 2: Biology and Ecology of Parenting*, edited M. H. Bornstein. Mahwah, NJ: Lawrence Erlbaum Associates.
- Holmbeck, Grayson N., Roberta L. Paikoff, and Jeanne Brooks-Gunn. 1995. "Parenting Adolescents." Pp. 91-118 in *Handbook of Parenting, Vol. 1: Children and Parenting*, edited M. H. Bornstein. Mahwah, NJ: Lawrence Erlbaum Associates.
- Hout, Michael and Daniel P. Dohan. 1996. "Two Paths to Educational Opportunity: Class and Educational Selection in Sweden and the United States." Pp. 207-231 in *Can Education Be Equalized? The Swedish Case in Comparative Perspective*, edited by R. Erikson and J. O. Jonssen. Boulder, CO: Westview.
- Hout, Michael, Adrian Raftery, and Eleanor O. Bell. 1993. "Making the Grade: Educational Stratification in the United States, 1925-1989." Pp. 25-49 in *Persistent Inequality: Changing Educational Attainment in Thirteen Countries*, edited by Y. Shavit and H.-P. Blossfeld. Boulder, CO: Westview.
- Kohn, Melvin L.. 1969. *Class and Conformity: A Study in Values*. Homewood, IL: Dorsey.
- Kohn, Melvin L. and Carmin Schooler. 1983. *Work and personality : an inquiry into the impact of social stratification*. Norwood, NJ: Ablex.

- Kohn, Melvin L., Kazimierz M. Slomczynski, Carrie Schoenbach. 1986. Social Stratification and Transmission of Values in the Family: A Cross-National Assessment. *Sociological Forum* 1: 73-102.
- Kuan, Ping-Yin and Meng-Li Yang. 2004. "Educational Achievement and Family Structure: Evidence from Two Cohorts of Adolescents in Taiwan." Paper presented at the Conference on Social Stratification, Mobility, and Exclusion, the Research Committee on Social Stratification (RC28) of the International Sociological Association, Neuchatel, Switzerland, May 7-9 2004.
- Macoby, Eleanor E. and J. A. Martin. 1983. "Socialization in the Context of the Family." Pp. 1-101 in *Handbook of Child Psychology: Vol. 4. Socialization, Personality, and Social Development*, edited by E. M. Heatherington (Vol. Ed.), P. H. Mussen (Series Ed.). NEW YORK: Wiley.
- Lamborn, Susie D., Nina S. Mounts, Laurence Steinberg, and Sanford M. Dornbusch. 1991. "Patterns of Competence and Adjustment among Adolescents from Authoritative, Authoritarian, Indulgent, and Neglectful Families." *Child Development* 62: 1049-1065.
- Lareau, Annette. 1989. "Social Class Differences in Family-School Relationships: The Importance of Cultural Capital." *Sociology of Education*, 60: 73-85.
- Luster, Tom, Kelly Rhoades, and Bruce Hass. 1989. "The Relation between Parental Values and Parenting Behavior: A Test of Kohn Hypothesis." *Journal of Marriage and the Family* 51: 139-147.
- Ma, Li-Chen and Kevin Smith. 1990. "Social Class, Parental Values, and Child Rearing Practices in Taiwan." *Sociological Spectrum* 10: 577-589.
- Majorbanks, Kevin. 1996. "Family Socialization and Children's School Outcomes: An Investigation of A Parenting Model." *Educational Studies* 22: 3-11.
- McNeal, Ralph B., Jr.. 1999. "Parental Involvement as Social Capital: Differential Effectiveness on Science Achievement, Truancy, and Dropping Out." *Social Forces* 78: 117-144.
- Parke, Ross D.. 2002. "Fathers and Families." Pp. 27-73 in *Handbook of Parenting, Vol. 3: Being and Becoming a Parent*, edited M. H. Bornstein. Mahwah, NJ: Lawrence Erlbaum Associates.
- Paulson, Sharon E. and Cheryl L. Sputa, 1996. "Patterns of Parenting during Adolescence: Perceptions of Adolescents and Parents." *Adolescence* 31: 369-381.
- Pearlin, Leonard I. and Melvin L. Kohn. 1966. "Social Class, Occupation, and Parental Values: A Cross-National Study." *American Sociological Review* 31: 466-479.
- Peng, Samuel and Deeann Wright. 1994. "Explanation of Academic Achievement of Asian American Students." *Journal of Educational Research* 87: 346-352.
- Pipp, Sandra, Phillip Shaver, Sybillyn Jennings, Susie Lamborn, and Kurt W. Fischer. 1985. "Adolescents' Theories about the Development of Their Relationships with Parents." *Journal of Personality and Social Psychology*, 48: 991-1001.
- Pleck, Joseph H.. 1997. "Paternal Involvement: Levels, Sources, and Consequences." Pp. 66-103 in *The Role of the Father in Child Development*. NEW YORK: John Wiley and Sons.
- Pong, Suet-Ling, Lingxin Hao, and Erica Gardner, 2005. "The Roles of Parenting Styles and Social Capital in the School Performance of Immigrant Asian and Hispanic Adolescents." *Social Science Quarterly* 86: 928-950.

- Shavit, Yossi and Hans-Peters Blossfeld, eds. 1993. *Persistent Inequality: Changing Educational Attainment in Thirteen Countries*. Boulder, CO: Westview.
- Siu-Chu, Ho Esther and J. Douglas Willms. 1996. "Effects of Parental Involvement on Eighth-Grade Achievement." *Sociology of Education* 69: 126-141.
- Steinberg, Laurence, Julie D. Elmen, and Nina S. Mounts. 1989. "Authoritative Parenting, Psychological Maturity, and Academic Success among Adolescents." *Child Development* 60: 1424-1436.
- Steinberg, Laurence, Susie D. Lamborn, Nancy Darling, Nina S. Mounts, and Sanford M. Dornbusch. 1994. "Over-Time Changes in Adjustment and Competence among Adolescents from Authoritative, Authoritarian, Indulgent, and Neglectful Families." *Child Development* 65: 754-770.
- Steinberg, Laurence, Susie D. Lamborn, Sanford M. Dornbusch, and Nancy Darling. 1992. "Impact of Parenting Practices on Adolescent Achievement: Authoritative Parenting, School Involvement, and Encouragement to Succeed." *Child Development* 63: 1266-1281.
- Steinberg, Laurence, Nina S. Mounts, Susie D. Lamborn, and Sanford M. Dornbusch. 1991. "Authoritative Parenting and Adolescent Adjustment Across Varied Ecological Niche." *Journal of Research on Adolescence* 1: 19-36.
- Stewart, Sunita Mahtani and Michael Harris Bond. 2002. "A Critical Look at Parenting Research from the Mainstream: Problems Uncovered While Adapting Western Research to Non-Western Cultures." *British Journal of Developmental Psychology* 20:379-392.
- Tam, Tony, Meng-Li Yang, Ly-Yun Chang, and Ping-Yin Kuan. 2004. "Family in the Making of Educational Inequality: A Comparative Analysis of Taiwan and the U.S." Paper presented at the Conference on Social Stratification, Mobility, and Exclusion, the Research Committee on Social Stratification (RC28) of the International Sociological Association, Neuchatel, Switzerland, May 7-9 2004.
- Trivette, Paul and Eileen Anderson. 1995. "The Effects of Four Components of Parental Involvement on Eighth-Grade Student." *School Psychology Review* 24: 299-318.
- Useem, Elizabeth L.. 1992. "Middle School and Math Groups: Parents' Involvement in Children's Placement." *Sociology of Education* 65: 263-279.
- Wang, Margaret C., Geneva D. Haertel, and Herbert D. Walberg. 1993. "Toward a Knowledge Base for School Learning." *Review of Educational Research* 63: 249-294.
- Whitbeck Les B., Ronald L. Simmons, Rand D. Conger, Frederick O. Lorenz, Shirley Huck, and Glen H. Elder, Jr.. 1991. "Family Economic Hardship, Parental Support, and Adolescent Self-Esteem." *Social Psychology Quarterly* 54: 353-363.
- Winship, Christopher and Stephen L. Morgan. 1999. "The Estimation of Causal Effects from Observational Data." *Annual Review of Sociology* 25: 659-707.
- Wright, James D. and Sonia R. Wright. 1976. "Social Class and Parental Values for Children: A Partial Replication and Extension of the Kohn Thesis." *American Sociological Review* 41: 527-537.
- Yi, Chin-Chun, Chin-Fen Chang, and Ying-Hwa Chang. 2004. "The Intergenerational Transmission of Family Values: A Comparison between Teenagers and Parents in Taiwan." *Journal of Comparative Family Study* 35: 523-545.

Youniss, James and Jacqueline Smollar. 1985. *Adolescent Relations with Mothers, Fathers and Friends*. Chicago: University of Chicago Press.

表 1 國中生母親教養方式之探索性因素（EFA）分析結果

母親教養方式	因子		
TEPS 變項	Factor 1	Factor 2	Factor 3
明確要求作息	0.732	0.094	0.123
嚴格管如何用錢	0.602	0.189	-0.008
管功課	0.670	0.190	0.038
明確要求言行舉止及服裝儀容	0.701	0.088	0.138
明確要求飲食或健康習慣	0.662	-0.014	0.206
嚴格管交朋友的事	0.618	0.232	0.067
經常告訴不要傷父母的心或作讓父母丟臉的事	0.503	0.251	0.145
在管教時，不准插嘴或回嘴	0.442	0.377	0.049
一叫做事不得延誤	0.281	0.529	-0.064
為了一點小事，動不動就大罵	0.160	0.797	-0.261
為了一點小事，動不動就打	0.064	0.735	-0.008
平常在家會認真聽你的想法，和你溝通	0.268	-0.300	0.753
經常拿兄弟姐妹或別人家的子女做比較	0.339	0.441	-0.145
不太放心，一再重複叮嚀	0.574	0.099	0.111
和你相關的事，通常由母親來做決定	0.480	0.204	0.131
對新想法或嘗試潑冷水	0.151	0.553	-0.225
不論是什麼東西或事情，當你想要時，總是會答應要求	0.065	-0.037	0.430
碰到重大問題或挫折時，會特別撥出時間來幫助你	0.219	-0.174	0.778

表 2 國中生母親驗證性（CFA）模型適配度*

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	2640.177, df= 66, P-Value<0.0001	P>.05
Chi-Square Test of Model Fit for the Baseline Model	29440.717, df=50, P-Value<0.0001	P>.05
CFI	0.91	>.90
TLI	0.93	>.90
RMSEA	0.061	<.05
SRMR	0.06	<.10

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 3 國中生母親教養方式各因子對各對應指標的解釋力

因子	指標	R-Square
Factor1	明確要求作息	0.563
	嚴格管如何用錢	0.397
	管功課	0.476
	明確要求言行舉止及服裝儀容	0.518
	明確要求飲食或健康習慣	0.457
	嚴格管交朋友的事	0.446
	經常告訴不要傷父母的心或作讓父母丟臉的事	0.318
	不太放心，一再重複叮嚀	0.324
Factor2	一叫做事不得延誤	0.400
	為了一點小事，動不動就大罵	0.702
	為了一點小事，動不動就打	0.435
	對新想法或嘗試潑冷水	0.361
Factor3	不論是什麼東西或事情，當你想要時，總是會答應要求	0.802
	碰到重大問題或挫折時，會特別撥出時間來幫助你	0.620

表 4 國中生父親 CFA 模型 goodness of fit*

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	1161.986, df= 55, P-Value<0.0001	P>.05
Chi-Square Test of Model Fit for the Baseline Model	25344.283, df=45, P-Value<0.0001	P>.05
CFI	0.96	>.90
TLI	0.96	>.90
RMSEA	0.044	<.05
SRMR	0.06	<.10

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 5 國中生父親教養方式各因子對各對應指標的解釋力

因子	指標	R-Square
Factor1	明確要求作息	0.596
	嚴格管如何用錢	0.453
	管功課	0.463
	明確要求言行舉止及服裝儀容	0.516
	明確要求飲食或健康習慣	0.483
	嚴格管交朋友的事	0.458
	經常告訴不要傷父母的心或作讓父母丟臉的事	0.351
	不太放心，一再重複叮嚀	0.351
Factor2	一叫做事不得延誤	0.456
	為了一點小事，動不動就大罵	0.705
	為了一點小事，動不動就打	0.534
	對新想法或嘗試潑冷水	0.386
Factor3	不論是什麼東西或事情，當你想要時，總是會答應要求	0.731
	碰到重大問題或挫折時，會特別撥出時間來幫助你	0.608

表 6 國中生父母親教養方式各因子與第一波及第二波父母接納與嚴格管教受訪者各題項之相關[#]

	W1 父親 接納	W1 父親 嚴格	W1 母親 接納	W1 母親 嚴格	W2 母親 Factor 1	W2 母親 Factor 2	W2 母親 Factor 3	W2 父親 Factor 1	W2 父親 Factor 2	W2 父親 Factor 3
W1 父接納	1.000									
W1 父嚴格	-0.018*	1.000								
W1 母接納	0.458**	0.093**	1.000							
W1 母嚴格	0.104**	0.428**	0.019	1.000						
W2 母親 Factor 1	0.059**	0.096**	0.059**	0.216**	1.000					
W2 母親 Factor 2	-0.062**	0.060**	-0.167**	0.205**	0.536**	1.000				
W2 母親 Factor 3	0.135**	0.009	0.242**	-0.010	0.421**	-0.416**	1.000			
W2 父親 Factor 1	0.064**	0.231**	0.042**	0.074**	0.377**	0.151**	0.200**	1.000		
W2 父親 Factor 2	-0.205**	0.230**	-0.047**	0.032**	0.160**	0.260**	-0.111**	0.468**	1.000	
W2 父親 Factor 3	0.246**	0.037**	0.087**	0.038**	0.208**	0.081**	0.342**	0.602**	-0.297	1.000
W2 父接納	0.243**	-0.056**	0.125**	0.001	0.111**	-0.113**	0.271**	0.220**	-0.235**	0.445**
W2 父嚴格	-0.077**	0.297**	0.027**	0.027**	0.113**	0.036**	0.061**	0.445**	0.413**	0.413**
W2 母接納	0.130**	-0.019	0.224**	-0.066**	0.160**	-0.279**	0.515**	0.096**	-0.104**	0.279**
W2 母嚴格	0.052**	0.006	-0.040**	0.270**	0.424**	0.39**	0.029**	0.037**	-0.038**	0.037**

[#]W1 答項為：1-非常符合、2-符合、3-不符合、4-非常不符合，重新編碼為：4-非常符合、3-符合、2-不符合、1-非常不符合；W2 母接納與嚴格題目答項編碼：有 1，無 0。

* P < .05 ** P < .01

表 7 高中職五專生母親教養方式之探索性因素（EFA）分析結果

母親教養方式	因子		
TEPS 變項	Factor 1	Factor 2	Factor 3
明確要求作息	0.753	0.103	0.106
嚴格管如何用錢	0.640	0.200	-0.039
管功課	0.737	0.159	0.016
明確要求言行舉止及服裝儀容	0.698	0.168	0.154
明確要求飲食或健康習慣	0.655	0.062	0.261
嚴格管交朋友的事	0.671	0.240	0.044
經常告訴不要傷父母的心或作讓父母丟臉的事	0.517	0.311	0.091
在管教時，不准插嘴或回嘴	0.396	0.525	0.053
一叫做事不得延誤	0.234	0.589	-0.020
為了一點小事，動不動就大罵	0.146	0.805	-0.284
為了一點小事，動不動就打	0.111	0.718	-0.113
平常在家會認真聽你的想法，和你溝通	0.187	-0.233	0.793
經常拿兄弟姊妹或別人家的子女做比較	0.357	0.400	-0.184
不太放心，一再重複叮嚀	0.512	0.192	0.055
和你相關的事，通常由母親來做決定	0.399	0.272	0.221
對新想法或嘗試潑冷水	0.212	0.509	-0.241
不論是什麼東西或事情，當你想要時，總是會答應要求	0.030	-0.061	0.448
碰到重大問題或挫折時，會特別撥出時間來幫助你	0.191	-0.129	0.761

表 8 高中職五專生母親 CFA 模型適配度（15 個指標）*

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	2640.177，df= 66，P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	29440.717，df=50，P-Value=0.0000	P>.05
CFI	0.91	>.90
TLI	0.93	>.90
RMSEA	0.061	<.05
SRMR	0.06	<.10

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判斷，而其他模型適配指標皆達到可接受標準。

表 9 高中職五專生母親 CFA 模型適配度（14 個指標）*

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	1489.405 , df= 56 , P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	27146.109 , df=46 , P-Value=0.0000	P>.05
CFI	0.95	>.90
TLI	0.96	>.90
RMSEA	0.049	<.05
SRMR	0.062	<.10

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 10 高中職五專生母親教養方式各因子對各對應指標的解釋力

因子	指標	R-Square
Factor1	明確要求作息	0.574
	嚴格管如何用錢	0.446
	管功課	0.544
	明確要求言行舉止及服裝儀容	0.545
	明確要求飲食或健康習慣	0.465
	嚴格管交朋友的事	0.516
	經常告訴不要傷父母的心或作讓父母丟臉的事	0.219
	不太放心，一再重複叮嚀	0.290
Factor2	一叫做事不得延誤	0.427
	為了一點小事，動不動就大罵	0.667
	為了一點小事，動不動就打	0.484
	對新想法或嘗試潑冷水	0.379
Factor3	不論是什麼東西或事情，當你想要時，總是會答應要求	0.758
	碰到重大問題或挫折時，會特別撥出時間來幫助你	0.603

表 11 高中職五專生父親 CFA 模型 goodness of fit*

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	1425.031, df= 55, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	27934.437, df=41, P-Value=0.0000	P>.05
CFI	0.95	>.90
TLI	0.96	>.90
RMSEA	0.048	<.05
SRMR	0.061	<.10

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判斷，而其他模型適配指標皆達到可接受標準。

表 12 高中職五專生父親教養方式各因子對各對應指標的解釋力

因子	指標	R-Square
Factor1	明確要求作息	0.609
	嚴格管如何用錢	0.522
	管功課	0.554
	明確要求言行舉止及服裝儀容	0.541
	明確要求飲食或健康習慣	0.501
	嚴格管交朋友的事	0.527
	經常告訴不要傷父母的心或作讓父母丟臉的事	0.401
	不太放心，一再重複叮嚀	0.375
Factor2	一叫做事不得延誤	0.501
	為了一點小事，動不動就大罵	0.614
	為了一點小事，動不動就打	0.532
	對新想法或嘗試潑冷水	0.416
Factor3	不論是什麼東西或事情，當你想要時，總是會答應要求	0.699
	碰到重大問題或挫折時，會特別撥出時間來幫助你	0.613

表 13 國中樣本之家庭社經地位對母親管教結構模型模型適配度

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	1804.279 , df= 92 , P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	25487.198 , df=77 , P-Value=0.0000	P>.05
CFI	0.933	>.90
TLI	0.944	>.90
RMSEA	0.043	<.05

表 14 國中樣本之家庭社經地位對母親管教結構模型估計係數

	Estimates	S.E.	Est./S.E.
社經地位			
Factor 1	-0.023	0.011	-2.179
Factor 2	0.000	0.011	-0.040
Factor 3	0.127	0.014	8.892
男生			
Factor 1	-0.040	0.017	-2.325
Factor 2	-0.099	0.018	-5.532
Factor 3	-0.093	0.023	-4.091
Factor 1 WITH			
Factor 2	0.193	0.009	21.808
Factor 3 WITH			
Factor 1	0.240	0.010	23.565
Factor 2	-0.232	0.011	-21.027

表 15 國中生家庭社經地位對父親管教結構模型適配度

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	1562.839 , df= 91 , P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	27478.344 , df=75 , P-Value=0.0000	P>.05
CFI	0.946	>.90
TLI	0.956	>.90
RMSEA	0.04	<.05

表 16 國中樣本之家庭社經地位對母親管教結構模型估計係數

	Estimates	S.E.	Est./S.E.
社經地位			
Factor 1	0.020	0.011	1.816
Factor 2	-0.003	0.012	-0.231
Factor 3	0.154	0.014	10.775
男生			
Factor 1	0.119	0.018	6.681
Factor 2	0.043	0.019	2.275
Factor 3	0.147	0.023	6.477
Factor 1 WITH			
Factor 2	0.192	0.009	21.376
Factor 3 WITH			
Factor 1	0.324	0.010	31.323
Factor 2	-0.177	0.011	-15.899

表 17 高中職五專生樣本之家庭社經地位對母親管教結構模型模型適配度

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	1916.890 , df= 92 , P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	29344.675 , df=76 , P-Value=0.0000	P>.05
CFI	0.938	>.90
TLI	0.948	>.90
RMSEA	0.043	<.05

表 18 高中職五專生樣本之家庭社經地位對母親管教結構模型估計係數

	Estimates	S.E.	Est./S.E.
社經地位			
Factor 1	-0.041	0.011	-3.903
Factor 2	-0.013	0.011	-1.153
Factor 3	0.102	0.014	7.505
男生			
Factor 1	-0.019	0.017	-1.097
Factor 2	-0.104	0.018	-5.758
Factor 3	-0.166	0.022	-7.603
Factor 1 WITH			
Factor 2	0.228	0.009	26.082
Factor 3 WITH			
Factor 1	0.184	0.010	18.768
Factor 2	-0.218	0.011	-20.644

表 19 高中職五專生家庭社經地位對父親管教結構模型適配度

適配指標	指標值	判斷標準
Chi-Square Test of Model Fit	1823.642 , df= 91 , P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	30088.715 , df=69 , P-Value=0.0000	P>.05
CFI	0.942	>.90
TLI	0.956	>.90
RMSEA	0.042	<.05

表 20 高中職五專生樣本之家庭社經地位對母親管教結構模型估計係數

	Estimates	S.E.	Est./S.E.
社經地位			
Factor 1	0.027	0.011	2.402
Factor 2	0.042	0.012	3.453
Factor 3	0.145	0.014	10.403
男生			
Factor 1	0.131	0.018	7.413
Factor 2	0.074	0.019	3.831
Factor 3	0.045	0.022	2.111
Factor 1 WITH			
Factor 2	0.245	0.009	26.323
Factor 3 WITH			
Factor 1	0.273	0.010	26.895
Factor 2	-0.176	0.011	-15.805

表 21 國中生父母共同教養方式之驗證性因素（CFA）分析結果：面向與指標

父母共同教養方式面向	指標	TEPS 變項編號
Factor1（父親明確常規要求）	明確要求作息	W2S2012
	明確要求言行舉止及服裝儀容	W2S2042
	明確要求飲食或健康習慣	W2S2052
Factor2（父親嚴厲管教）	一叫你做事，就得馬上做不能延誤，也不管你正在忙什麼	W2S2092
	為了一點小事，動不動就大罵你	W2S2102
	為了一點小事，動不動就動手打你	W2S2112
	當你有一些新的想法或嘗試時，會潑你冷水	W2S2162
Factor3（母親明確常規要求）	明確要求作息	W2S2013
	明確要求言行舉止及服裝儀容	W2S2043
	明確要求飲食或健康習慣	W2S2053
Factor4（母親嚴厲管教）	一叫你做事，就得馬上做不能延誤，也不管你正在忙什麼	W2S2093
	為了一點小事，動不動就大罵你	W2S2103
	為了一點小事，動不動就動手打你	W2S2113
	當你有一些新的想法或嘗試時，會潑你冷水	W2S2163
Factor5（父母均給予支持回應）	平常在家會認真聽你的想法，和你溝通	W2S2122
	上國中以來，碰到重大問題或挫折時，家裡誰會特別撥出時間來幫助你？	W2S2182
	平常在家會認真聽你的想法，和你溝通	W2S2123
	上國中以來，碰到重大問題或挫折時，家裡誰會特別撥出時間來幫助你？	W2S2183:

表 22 國中生父母共同教養方式之 CFA 分析結果：模型適配度*

	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	2099.429, df=78, P-Value < 0.0001	P>.05
Chi-Square Test of Model Fit for the Baseline Model	15686.512, df=71, P-Value < 0.0001	P>.05
CFI	0.871	>.90
TLI	0.882	>.90
RMSEA	0.050	<.1
SRMR	0.083	<.08

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 23 國中生父母共同教養方式各因子對各對應指標的解釋力

因子	指標	R-Square
Factor1 (父親明確常規要求)	明確要求作息	.498
	明確要求言行舉止及服裝儀容	.551
	明確要求飲食或健康習慣	.605
Factor2 (父親嚴厲管教)	一叫你做事，就得馬上做不能延誤，也不管你正在忙什麼	.361
	為了一點小事，動不動就大罵你	.668
	為了一點小事，動不動就動手打你	.610
	當你有一些新的想法或嘗試時，會潑你冷水	.451
Factor3 (母親明確常規要求)	明確要求作息	.667
	明確要求言行舉止及服裝儀容	.547
	明確要求飲食或健康習慣	.573
Factor4 (母親嚴厲管教)	一叫你做事，就得馬上做不能延誤，也不管你正在忙什麼	.302
	為了一點小事，動不動就大罵你	.667
	為了一點小事，動不動就動手打你	.541
	當你有一些新的想法或嘗試時，會潑你冷水	.465
Factor5 (父母皆給予支持回應)	平常在家會認真聽你的想法，和你溝通	.480
	上國中以來，碰到重大問題或挫折時，家裡誰會特別撥出時間來幫助你？	.561
	平常在家會認真聽你的想法，和你溝通	.560
	上國中以來，碰到重大問題或挫折時，家裡誰會特別撥出時間來幫助你？	.628

表 24 國中生父親與母親參與子女學習教養作為之 CFA 分析結果：模型適配度*

父親教養作為之 CFA 分析結果		
	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	0, df=0, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	2010.691, df=3, P-Value=0.0000	P>.05
CFI	1.000	>.90
TLI	1.000	>.90
RMSEA	0.000	<.1
SRMR	0.000	<.08

母親教養作為之 CFA 分析結果		
	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	0, df=0, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	2650.378, df=3, P-Value=0.0000	P>.05
CFI	1.000	>.90
TLI	1.000	>.90
RMSEA	0.000	<.1
SRMR	0.000	<.08

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 25 國中生父親與母親參與子女學習教養作為各因子對各對應指標的解釋力

	指標	R-Square
父親教養作為	會不會談升學或就業的事情	.318
	會不會看作業或考卷，瞭解學習情況	.531
	會不會參加學校的活動，或擔任家長會委員或義工	.166
母親教養作為	會不會談升學或就業的事情	.427
	會不會看作業或考卷，瞭解學習情況	.506
	會不會參加學校的活動，或擔任家長會委員或義工	.196

表 26 以國三綜合能力分數為依變項之結構方程模型 A 適配度*

	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	4008.310, df=191, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	33266.875, df=160, P-Value=0.0000	P>.05
CFI	0.885	>.90
TLI	0.903	>.90
RMSEA	0.046	<.1

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 27 以國三綜合能力分數為依變項之結構方程模型 A 參數估計

變項		Estimates	S.E.	Est./S.E.
父母社經地位				
	F1	.070	.021	3.264
	F2	.015	.020	.752
	M1	.046	.021	2.167
	M2	.010	.019	.526
	FM	.173	.020	8.787
	FMi	.272	.017	15.558
	w2all3p	.617	.023	26.413
F1				
	FMi	.111	.038	2.918
	w2all3p	-.148	.051	-2.899
F2				
	FMi	-.010	.038	-.265
	w2all3p	-.094	.051	-1.836
M1				
	FMi	.127	.040	3.148
	w2all3p	.041	.052	.779
M2				
	FMi	-.022	.041	-.546
	w2all3p	-.034	.055	-.621
FM				
	FMi	.165	.026	6.437
	w2all3p	.091	.030	3.021
FMi	w2all3p	.144	.023	6.207
F1 相關				
	F2	.119	.011	11.227
	M1	.297	.014	20.442
	FM	.220	.011	20.190
F2 相關				
	M2	.156	.011	13.707
	FM	-.100	.010	-10.476
M1 相關				
	M2	.091	.011	8.627
	FM	.177	.011	16.696
M2 相關				
	FM	-.133	.009	-14.015

代號說明：F1：父親明確常規要求；F2：父親嚴厲管教；M1：母親明確常規要求；M2：母親打罵管教；FM：父母皆給予支持回應；FMi：父母參與子女學習教養作為；w2all3p：國三綜合能力分數

表 28 以國三綜合能力分數為依變項之結構方程模型 B 適配度*

模型 goodness of fit		判斷標準
Chi-Square Test of Model Fit	3848.551, df=189, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	33266.875, df=160, P-Value=0.0000	P>.05
CFI	0.889	>.90
TLI	0.906	>.90
RMSEA	0.046	<.1

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 29 以國三綜合能力分數為依變項之結構方程模型 B 參數估計

		Estimates	S.E.	Est./S.E.
父母社經地位				
	F1	.070	.022	3.266
	F2	.015	.020	.752
	M1	.046	.021	2.160
	M2	.010	.019	.526
	FM	.173	.020	8.787
	Fi	.271	.020	13.454
	Mi	.248	.021	11.766
	W2all3p	.661	.024	25.070
F1	Fi	.475	.056	8.446
	Mi	-.342	.061	-5.591
	W2all3p	-.236	.054	-4.352
F2	Fi	-.207	.056	-3.689
	Mi	.228	.061	3.718
	W2all3p	-.047	.046	-1.030
M1	Fi	-.249	.058	-4.274
	Mi	.561	.066	8.558
	W2all3p	.126	.051	2.442
M2	Fi	.165	.058	2.821
	Mi	-.242	.067	-3.639
	W2all3p	-.078	.048	-1.641
FM	Fi	.148	.030	4.964
	Mi	.176	.032	5.429
	W2all3p	.092	.031	2.966
Fi	W2all3p	.196	.088	2.221
Mi	W2all3p	-.031	.079	-.397
F1	相關			
	F2	.120	.011	11.260
	M1	.284	.014	20.841
	FM	.222	.011	20.346
F2	相關			
	M2	.156	.011	13.712
	FM	-.100	.010	-10.475
M1	相關			
	M2	.092	.011	8.656
	FM	.178	.011	16.801
M2	相關			
	FM	-.133	.009	-14.016
Fi	相關			
	Mi	.307	.011	27.507

代號說明：F1：父親明確常規要求；F2：父親嚴厲管教；M1：母親明確常規要求；M2：母親打罵管教；
FM：父母皆給予支持回應；w2all3p：國三綜合能力分數

表 30 高中職五專生父母共同教養方式之 CFA 分析結果：模型適配度*

	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	2025.480, df=72, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	14288.467, df=67, P-Value=0.0000	P>.05
CFI	0.861	>.90
TLI	0.870	>.90
RMSEA	0.051	<.1
SRMR	0.087	<.08

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 31 高中職五專生父母共同教養方式各因子對各對應指標的解釋力

因子	指標	R-Square
Factor1 (父親明確常規要求)	明確要求作息	.522
	明確要求言行舉止及服裝儀容	.581
	明確要求飲食或健康習慣	.612
Factor2 (父親嚴厲管教)	一叫你做事，就得馬上做不能延誤，也不管你正在忙什麼	.413
	為了一點小事，動不動就大罵你	.620
	為了一點小事，動不動就動手打你	.621
	當你有一些新的想法或嘗試時，會潑你冷水	.439
Factor3 (母親明確常規要求)	明確要求作息	.492
	明確要求言行舉止及服裝儀容	.596
	明確要求飲食或健康習慣	.599
Factor4 (母親嚴厲管教)	一叫你做事，就得馬上做不能延誤，也不管你正在忙什麼	.377
	為了一點小事，動不動就大罵你	.679
	為了一點小事，動不動就動手打你	.553
	當你有一些新的想法或嘗試時，會潑你冷水	.406
Factor5 (父母皆給予支持回應)	平常在家會認真聽你的想法，和你溝通	.524
	上國中以來，碰到重大問題或挫折時，家裡誰會特別撥出時間來幫助你？	.582
	平常在家會認真聽你的想法，和你溝通	.509
	上國中以來，碰到重大問題或挫折時，家裡誰會特別撥出時間來幫助你？	.576

表 32 高中職五專生父親與母親參與子女學習教養作為之 CFA 分析結果：模型適配度*

父親教養作為之 CFA 分析結果		
	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	0, df=0, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	3801.251, df=3, P-Value=0.0000	P>.05
CFI	1.000	>.90
TLI	1.000	>.90
RMSEA	0.000	<.1
SRMR	0.000	<.08

母親教養作為之 CFA 分析結果		
	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	0, df=0, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	6337.149, df=3, P-Value=0.0000	P>.05
CFI	1.000	>.90
TLI	1.000	>.90
RMSEA	0.000	<.1
SRMR	0.000	<.08

*本模型之適配指標，除卡方值適配值不理想，但因本研究樣本數達萬人以上為大規模樣本，應以其餘模型適配度指標作為判準，而其他模型適配指標皆達到可接受標準。

表 33 高中職五專生父親與母親參與子女學習教養作為各因子對各對應指標的解釋力

	指標	R-Square
父親教養作為	會不會談升學或就業的事情	.318
	會不會看作業或考卷，瞭解學習情況	.531
	會不會參加學校的活動，或擔任家長會委員或義工	.166
母親教養作為	會不會談升學或就業的事情	.499
	會不會看作業或考卷，瞭解學習情況	.650
	會不會參加學校的活動，或擔任家長會委員或義工	.181

表 34 以高三/專三綜合能力分數為依變項之結構方程模型適配度*

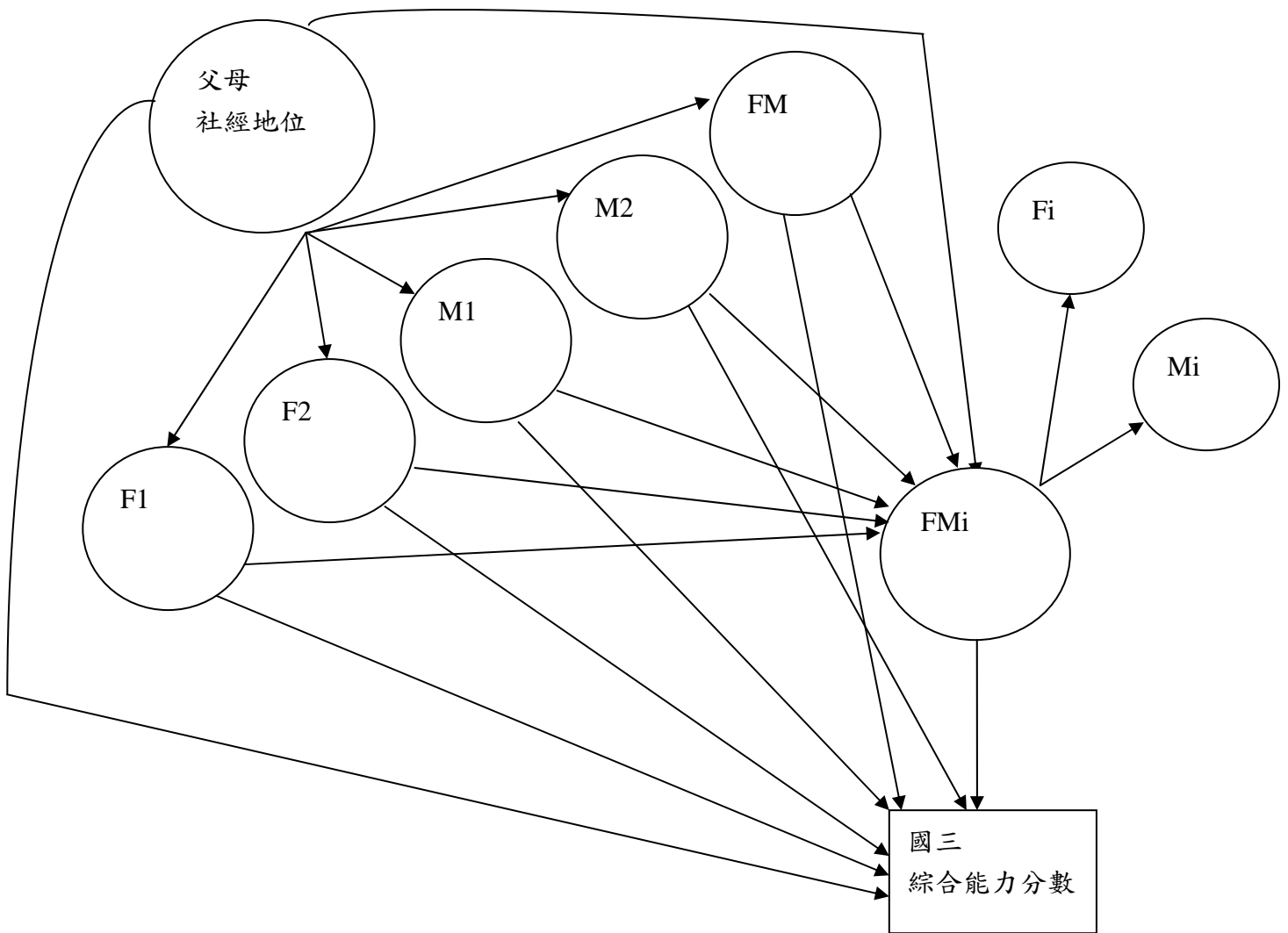
	模型 goodness of fit	判斷標準
Chi-Square Test of Model Fit	3916.242, df=168, P-Value=0.0000	P>.05
Chi-Square Test of Model Fit for the Baseline Model	29032.620, df=139, P-Value=0.0000	P>.05
CFI	0.870	>.90
TLI	0.893	>.90
RMSEA	0.048	<.1

表 35 以高三/專三綜合能力分數為依變項之結構方程模型參數估計

		Estimates	S.E.	Est./S.E.
父母社經地位				
	F1	.075	.022	3.361
	F2	.058	.021	2.702
	M1	-.041	.022	-1.834
	M2	-.029	.022	-1.324
	FM	.191	.022	8.783
	Fi	.242	.023	10.677
	Mi	.277	.026	10.605
	W2all3p	.517	.026	19.762
F1				
	Fi	.685	.109	6.301
	Mi	-.589	.133	-4.445
	W2all3p	-.171	.081	-2.108
F2				
	Fi	-.347	.105	-3.293
	Mi	.429	.128	3.356
	W2all3p	.000	.055	-.002
M1				
	Fi	-.466	.109	-4.283
	Mi	.763	.130	5.860
	W2all3p	.007	.077	.089
M2				
	Fi	.165	.058	2.821
	Mi	-.242	.067	-3.639
	W2all3p	-.146	.064	-2.279
FM				
	Fi	.233	.031	7.448
	Mi	.292	.036	8.096
	W2all3p	.069	.035	1.98
Fi				
	W2all3p	.073	.119	.612
Mi				
	W2all3p	.066	.100	.660
F1	相關			
	F2	.144	.012	11.753
	M1	.312	.015	21.308
	FM	.222	.012	19.180
F2	相關			
	M2	.180	.013	13.655
	FM	-.123	.011	-10.808
M1	相關			
	M2	.151	.012	12.717
	FM	.175	.011	15.233
M2	相關			
	FM	-.124	.011	-11.290
Fi	with			
	Mi	.318	.017	18.946

代號說明：F1：父親明確常規要求；F2：父親嚴厲管教；M1：母親明確常規要求；M2：母親打罵管教；
FM：父母皆給予支持回應；w2all3p：國三綜合能力分數

圖 1 以國三綜合能力分數為依變項之結構方程模型 A

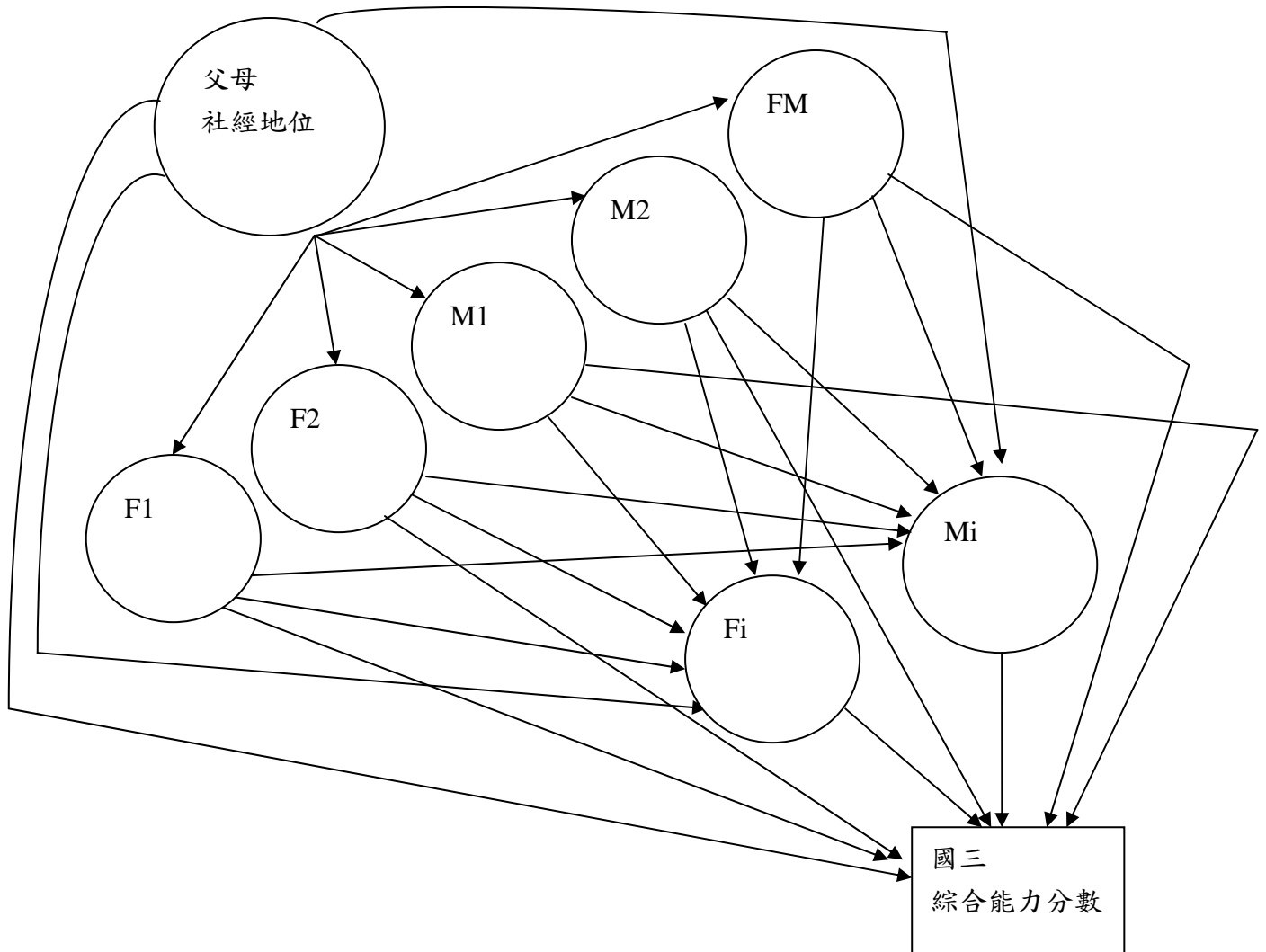


代號說明：F1：父親明確常規要求；F2：父親嚴厲管教；M1：母親明確常規要求；M2：母親打罵管教；

FM：父母皆給予支持回應；Fi：父親參與子女學習教養作為；Mi：母親參與子女學習教養作為；FMi：

父母參與子女學習教養作為

圖 2 以國三綜合能力分數為依變項之結構方程模型 B



代號說明：F1：父親明確常規要求；F2：父親嚴厲管教；M1：母親明確常規要求；M2：母親打罵管教；
FM：父母皆給予支持回應；Fi：父親參與子女學習教養作為；Mi：母親參與子女學習教養作為

附錄 1：TEPS 國中樣本與父母教養方式相關之題項及變項編號

測量題目	父親：變項編號	母親：變項編號
誰會明確要求你的生活作息？	W2S2012	W2S2013
誰會嚴格管你這麼用錢？	W2S2022	W2S2023
誰會嚴格管你的功課？	W2S2032	W2S2033
誰會明確要求你的言行舉止及服裝儀容？	W2S2042	W2S2043
誰會明確要求你的飲食或健康習慣？	W2S2052	W2S2053
誰會嚴格管你交朋友的事？	W2S2062	W2S2063
誰會經常告訴不要傷父母的心或做讓父母丟臉的事？	W2S2072	W2S2073
誰會在管教你的時候，不准你插嘴或回嘴？	W2S2082	W2S2083
誰會一叫你做事，就得馬上做，也不管你正在忙什麼？	W2S2092	W2S2093
誰會為了一點小事，動不動就大罵？	W2S2102	W2S2103
誰會為了一點小事，動不動就打？	W2S2112	W2S2113
誰會平常在家會認真聽你的想法，和你溝通？	W2S2122	W2S2123
誰會經常拿兄弟姊妹或其他人家子女比較？	W2S2132	W2S2133
誰會對你不太放心，一再重複叮嚀？	W2S2142	W2S2143
和你相關的事情，通常是由誰來做決定？	W2S2152	W2S2153
當你有一些新的想法或嘗試時，誰會對潑你冷水？	W2S2162	W2S2163
不論什麼東西或事情，當你想要時，誰總是答應你的要求？	W2S2172	W2S2173
碰到重大問題或挫折時，家裡誰會特別撥出時間來幫助你？	W2S2182	W2S2183

行政院國家科學委員會補助國內專家學者出席國際學術會議報告

97 年 10 月 30 日

報告人姓名	關秉寅	服務機構 及職稱	國立政治大學社會學系 副教授
會議時間 地點	民國 97 年 8 月 6 日至 9 日 美國加州 Stanford University	本會核定 補助文號	NSC 96-2412-H-004-006-MY2
會議 名稱	(中文) 國際社會學會社會階層及流動研究委員會 (RC28) 2008 年夏季會議 (英文) The Summer Meeting 2008 of the Research Committee on Social Stratification and Mobility (RC28), International Sociological Association		
發表 論文 題目	(中文) 數學補習的效果：一個反事實的分析 (英文) The Effect of Cram Schooling on Math: A Counterfactual Analysis		

一、參加會議經過

本次國際社會學會社會階層及流動研究委員會（RC28 夏季會議於 2008 年 8 月 6 日至 9 日在美國加州 Palo Alto 的 Stanford University 舉行。此次會議的主辦單位為 Stanford Center for the Study of Poverty and Inequality。RC28 為國際社會學會相當活躍之研究委員會，與會者為來自世界各地研究社會階層相關議題的社會學者。每年 RC28 在 5 月份及 8 月份於全世界不同城市舉辦兩次學術會議。與會者需先於半年前投論文摘要，並經獲會議籌備委員會事先篩選通過後，得以參加此次盛會。

本次夏季會議主題定為 Work, Poverty, and Inequality in the 21st Century（廿一世紀的工作、貧窮與不平等）。這個主題固然與此次會議主辦單位 Stanford Center for the Study of Poverty and Inequality 長期關心的研究議題有關，但也反映了社會階層研究相關領域之學者對於世界各地的社會在全球化的進展下，各工業化社會內部，以及社會之間愈趨不平等之趨勢的關懷。會議於 8 月 7 日早上安排的主題發表場次（plenary session），即安排了歐美四篇論文，就歐美社會近年來為何收入不平等逐漸增加，提出不同的觀察與解釋。

本次會議一共安排了 30 多個不同論文主題的發表場次。這些主題涵蓋了與教育、人生歷程、收入、就業與失業、貧窮、階級與流動、族群、文化與生活風格、移民、家庭與婚姻、性別、健康等。本人此次所投之論文屬教育社會學之範疇，論文題目為 *The Effect of Cram Schooling on Math: A Counterfactual Analysis*。教育社會學的研究因與社會階層有關，故歷來也是屬於此會議所關心的主題之一。以本次會議言，與教育相關的場次即占約 1/3 的場次。這些場次討論的議題除了討論教育制度本身，如高等教育擴張的影響外，也包括了教育與各項社會面向及制度如階級、族群、婚姻、就業、收入等之間的關係。

本人此次所發表論文的內容，主要是以在社會學界逐漸受到重視的統計分析方法——propensity score matching（PSM），分析台灣教育長期追蹤資料庫的國中樣本資料。研究的目的是瞭解國三補習數學對數學學習成就的影響效果為何。此論文安排發表的場次為 8 月 9 日下午命名為 The Varieties of Training: From Cram Schools to Vocational Training 的場次。同場次中尚有來自美國、愛爾蘭及巴西的學者發表論文。在本人論文發表後，有美國、日本及中國大陸等各地的學者，於會中集會後表示對此論文的研究方法及發現感到興趣，並有學者建議應投稿美國一重要教育研究期刊。而使用 PSM 方法從事研究的趨勢，也可在本次會議中其他一些學者的論文報告中看出。

除了參與發表論文之場次外，三個全天的會議期間，本人主要參加聆聽的場次大多與本次會議主題有關之場次，以及與本人目前所從事之教育與勞力市場連結計畫有關的場次。

二、與會心得

本次與會的主要心得為：

- 1、本次會議中令人印象深刻的討論是在全球化經濟體系的競爭態勢下，先進工業國家的失業率高居不下。因此，失業後的長期影響為何已經成為一重要的議題。
- 2、RC28 的會議是以量化方法研究社會階層及流動之主要國際會議。社會階層及流動學者的量化研究在社會學界也一向是居翹楚的地位。目前觀察到的趨勢之一是利用長期追蹤的資料，以從事更嚴謹的因果推論。台灣社會學界在長期追蹤資料的建立，以及因果推論之分析方法等的發展雖已開始，但仍有待精進。
- 3、此次 RC28 會議，也可觀察到跨國比較研究是另一重要的趨勢。此次會議即有日本學者比較含台灣在內之東亞社會的職業期望及工作不穩定等現象。

三、考察參觀活動(無是項活動者省略)

四、建議

台灣社會學界歷年來均有優秀學者參與 RC28 的學術會議，也與多位 RC28 成員合作，參與推動比較研究。有鑑於此類會議對於推動比較研究，長期追蹤研究，以及量化研究等有重要貢獻。因此建議未來可以請 RC28 將台北列為定期輪辦會議的都市，以讓台灣社會學界與學子能有機會接觸國際學者及先進的研究觀念與方法。

五、攜回資料名稱及內容

- 1、會議議程及與會人員名單。

- 2、會議論文摘要及部分論文全文均可在此次會議的網站

http://www.stanford.edu/group/scspi/pdfs/rc28/conference_2008/rc28_program.pdf 上看到。

六、其他

The Effect of Cram Schooling for Math: A Counterfactual Analysis

Ping-Yin Kuan
Associate Professor
Department of Sociology
National Chengchi University
E-mail: soci1005@nccu.edu.tw

A paper prepared for the Summer Meeting on Work, Poverty, and Inequality in the 21st Century, the Research Committee on Social Stratification and Mobility (RC28), International Sociological Association, August 6-9, 2008, Stanford University, Palo Alto, California, USA. This paper is a part of the session of “The Varieties of Training: From Cram Schools to Vocational Training.”

Abstract

Private cram schooling is prevalent in Taiwan. Students go to cram schools or seek private tutoring after regular school hours in order to receive extra learning or gain a competitive edge. Since cram schooling is believed to have positive effects on learning achievement, which in turn will affect stratification process, the present paper attempts to answer the following questions: (1) What factors influence students' participation in math cramming? (2) Does cram schooling for math work? (3) If it works, how big is the average effect? (4) What kinds of student benefit most and least from math cramming?

Using data gathered by Taiwan Education Panel Study (TEPS) in 2001 and 2003, the present research employs the method of propensity score matching to estimate the average treatment effect of the 9th graders who participated in math cramming programs. The present research finds that family backgrounds and the previous math performance would influence the chances of students' participation in cram schooling for math. The results of the counterfactual analysis reveal that the average treatment effect of math cramming is fairly small. Moreover, the benefit of math cramming in general is negatively related to the tendency of participating in math cramming and the prior math ability.

Keywords: cram schooling, educational achievement, educational stratification, counterfactual, propensity score matching

The Effect of Cram Schooling for Math: A Counterfactual Analysis

Ping-Yin Kuan

In the last decade, the educational system in Taiwan has undergone significant changes. One important reform policy, as recommended by the officially sanctioned *Commission on Education Reform* (CER), was to improve the system of admission to senior high schools and universities (The Commission on Education Reform, 1996; see also Government Information Office, 2001). The reform involves a new system of multiple channels for admission and a reformed scheme of basic competency tests. One primary goal of these changes intended to stem the alarming and growing phenomenon of high school students attending *Buxiban* (cram schools) or seeking private supplementary tutoring after already long regular school hours. The main purpose of attending cram schools or tutoring programs is to do well in the competitive entrance examinations and be admitted to good schools or colleges. The CER, echoing the dissatisfaction of the public, concerned very much the negative psychological, educational, social, and economic impacts of the inordinate attention, both students and parents alike, on entrance examinations and the consequent emphasis on rote memorization of materials taught at both regular and cram schools.

After a decade of educational reform, the number of four-year colleges and universities has risen from 67 in 1996 to 147 in 2006 and net percentages of junior and senior high schools graduates entering a higher level of schooling were 99.77% and 83.91% respectively in 2006 (The Ministry of Education 2007). To the dismay of well-intentioned educational reformers, the prevalence of cram schooling among high school students has increased considerably. According to the online official statistics,

the number of so called Wen-Li¹ Buxiban, cramming schools served mainly to students preparing for major academic subjects covered by the entrance examination of all levels, has risen from 1,844 in 1999 to 9,344 in 2008 (Education Bureau, Kaohsiung City Government 2008). The phenomenal growth of registered Buxibans reflects the rising demand of aspired students and their parents.

The popularity of cramming programs has both cultural and institutional bases. Culturally, Taiwan, a predominantly ethnic Chinese society, has deep roots in Confucianism which emphasizes the value of meritocracy and the use of competitive examinations to choose talents (Zeng 1999). While the educational reform in Taiwan for the last decade has tried to make institutional changes that may lessen the influence of the examination culture on education, the core institutional arrangement so far still maintains nationally administered entrance examinations and the stake of examinations remains high. Students would need very high scores to be admitted to top ranked senior high schools and universities. Their allocated positions in the hierarchy of secondary schools and institutions of higher education are linked fairly tightly to the future opportunities in labor market and general status system. In short, the current educational system in Taiwan still has institutional characteristics that contribute to the development of shadow education (Stevenson and Baker 1992). On the individual level, the prevalence of attending cramming school may also reflect the belief of many students or their parents that cram schooling for examinations works. Whether cram schooling or private tutoring² has a positive effect on academic performance concerns not only the welfare of participating students, but also their fellow students who may not have opportunity or resource to undertake such activities.

¹ The literal meaning of Wen-Li in Chinese is “literature and science.”

² Since private tutoring and cram schooling are private supplementary learning activity, the present research will use “cram schooling,” which is more common, to cover both private tutoring and cram schooling in the following discussion.

If cram schooling is found to have a significant positive effect, it will have important consequences on the stratification process. Hence, the main research question of this paper is to investigate how big the effect, if any, of cramming for mathematics, a subject that many high school students in Taiwan, as everywhere else, find torturing and have difficulty in getting good scores in examinations.

It is not easy, however, to properly assess the effect of cram schooling on math performance. The researcher needs to account for all the important individual and social factors influencing students' participation in math cramming and math performance. As long as students are free to choose whether or not to participate in cramming programs and if there is any important unobservable variable such as intelligence, the researcher will have difficulty in getting unbiased estimate of the causal effect of cram schooling on math achievement. With these difficulties in mind, the following sections will first discuss in more details about the nature of cram schooling and its implications for the proper assessment of the effect of cram schooling. The attempt to properly estimate the effect of math cramming is framed by the section describing the counterfactual approach and the related method of propensity score matching. I then describe the data used for the analysis and present the findings.

The Nature of Cram Schooling and its Implications for Proper Assessment of Causal Effects

Specifically, the type of cramming activity examined in the present research has the following characteristics: (1) it is a type of organized and structured learning outside of schools, (2) the goal of participating in this type of supplementary learning is to prepare for the competitive process of entrance examinations and the preparation includes improvement and enhancement of students' knowledge about academic

subjects as well as test-taking skills, (3) the cramming activities may take place in large-sized classes or in the form of one-on-one tutoring, (4) the participation needs private resources provided mostly by students' families, (5) participating students may see the activities either as remedial intending to catch up with their fellow students or as enhancement aiming to gain a competitive edge (see also Baker, Akiba, LeTendre, and Wiseman 2001, Bray 2003).

Cram schooling as defined by the above characteristics gives clues to why cram schooling per se may have a positive effect on academic performance as well as the possibility that cram schooling may work differently for different kinds of students. These characteristics also point out that the assessment of effect of cram schooling is easily confounded with the effects of other factors influencing the opportunity of undertaking cram schooling and the possibility of omitted variables in previous studies.

The first three characteristics mentioned above are directly relevant to the expectation that cram schooling can have a positive effect on academic achievement. These three characteristics are related to extra learning time and instructional resources. There are at least three kinds of literature addressing the relationship between extra learning time and resources and academic performance. The first kind is about the effect of school learning time. John Carroll's (1963) "Model of Schooling Learning" is the first major theoretical framework stipulating the role of time played in learning a given task at school (see also Carroll 1989). Carroll maintains that success of learning a given task is dependent on the time a student spends in relation to the amount of time he or she needs to learn. Within his framework, three factors influencing "the time required to learn" are identified. They are: (1) student aptitude, (2) ability to understand instruction, and (3) quality of instruction. Two factors influencing "the time spent in learning" are: (1) time allowed for learning, and (2) the

time the learner is willing to learn.

Carroll's model shows that the relationship between learning time and learning achievement is dependent on student's ability, effort, given opportunity, and teaching environment. This model of school learning is supported by later empirical studies conducted in either experimental or actual school settings (e.g., Gettinger 1985, Berliner 1990). Further evaluation of empirical studies in industrial societies also shows that allocated time at school, such as the daily instructional time or number of school days, has little or no relationship to student achievement. In contrast, the amount of time that students are participating in learning activities (engaged time) and time when learning actually occurs (academic learning time) has impacts on student's achievement (Aronson, Zimmerman, and Carlos 1999).

Although Carroll's model is about school learning, it can be applied to the evaluation of the effect of cram schooling, which after all is considered as a shadow of formal schooling (Stevenson and Baker 1992). Clearly, extra learning time outside of schools by itself may or may not help students. According to Carroll's model, given extra learning time, the effect of cram schooling will be different among participating students depending on student's own initiative, ability and effort.

The second kind of literature that may lead us to expect cram schooling having a positive effect pertains to the work about the relationship between seasonal learning and student's achievement. Entwisle and her colleagues have used the "faucet theory" to explain poor children's increasing drawback in academic achievement after summer breaks (e.g., Entwisle, Alexander, and Olson 1997; Alexander, Entwisle, and Olson 2007). They find that poor and middle-class children make similar achievement gains when schools are in session. At times, poor or disadvantaged children may even gain a little bit more than middle-class children during the school year. When school is closed in summer, middle-class children still make progress in reading and math

because of better home learning environment and structured activities offered during the break. Lack of such kind of resources and activities, low-SES children lose grounds in learning during the summer. Hence, when school is in session, the faucet of learning resource is turned on, which benefits all children equally. Entwisle and her colleagues further point out that the disappointing result of the summer school in reducing achievement gap can be attributed to the fact that add-on services across the board benefits advantaged or brighter students more than disadvantaged or not so bright students (Entwisle, Alexander, and Olson 2001).

The findings of seasonal learning suggest that cram schooling as an extra learning resource provided by the family should benefit participating students positively in academic achievement. Moreover, the findings also suggest that extra structured learning provided by summer schools or cram schools may benefit students of different ability level or different backgrounds differently.

The third kind of literature reviewed here, in comparison with the previous discussed literature, is more directly relevant to the present research. This is the research literature about the effect of coaching or test preparation. The activities of coaching or improvement of test-taking skills mentioned in this literature, however, may take place in school or outside of school and in a relatively short period of time. The kind of coaching closest to cram schooling in Taiwan is coaching for the Scholastic Aptitude Test (SAT), a high-stakes test (see Becker 1990). Coaching for standardized tests like SAT involves acquiring familiarity with the test, reviewing material relevant to the test content, and learning testwiseness (Allalouf and Ben-Shakhar 1998: 32).. These elements of coaching for the SAT are in common with cram schooling defined earlier. Does coaching for the SAT help students to gain in the test? In her meta-analysis of 23 reports on coaching for the SAT, Becker (1990) concludes that coaching helps to increase SAT scores but the effects are fairly small.

In the case of SAT verbal test, the published studies show that the coached groups in general exceed control groups by 0.09 standard deviations. The effect of coaching is a bit stronger on SAT math test. The consistent result found is about 0.16 standard deviations. Becker's review also points out most of previous studies of coaching in general are poorly designed. A central design issue identified in the coaching literature is about the role of self-selection into coaching. In an attempt to address this issue, Briggs (2001) uses the method of propensity score matching to assess the effect of coaching on the SAT. He also concludes that coaching has very small positive effects.

The review of the possible effect of cram schooling so far has pointed out the issue of self-selection and possible heterogeneous causal effects even among those who participate in cram schooling. These issues have important implications for the proper evaluation of the causal effect of cram schooling. The last two characteristics of the nature of cram schooling mentioned earlier further demonstrate the possible complication involved in the accurate assessment of the causal effect of cram schooling.

The fourth characteristics mentioned above clearly show that students' participation in cram schooling not only involves family's economic capital but also social capital entailed by parental expectation and interest in children's learning. If cultural capital is considered as a resource monopolized by dominant social class signified by enforcing educational evaluative criteria favorable to their children (Lareau and Weininger 2003), then participation in cram schooling can also be viewed as a form of cultural capital invested by families to increase or ensure their children's opportunities in accessing scarce rewards. Hence, one possible baseline difference is in family's socioeconomic backgrounds and parental involvement in learning.

The fifth characteristics also indicate that the participation would need student's own initiative or at least their conformity to parental wish. Both students and parents

should also have some expectation that cram schooling would work. The individual difference in the willingness to participate and expectation of the outcome of the participation are also baseline differences.³ These family and individual differences may also have impacts on the actual effect of cram schooling. It is conceivable that students who have strong motivation to compete or high expectation of the cram schooling would have different gain in undertaking such an activity from those who are unwilling to go to cram schools but are coerced by their parents. It is also conceivable that students of better prior academic ability, which is very much influenced by better socioeconomic backgrounds and better schools (Shavit and Blossfeld 1993; Marks, Cresswell, and Ainley 2006), would benefit differently from those who are poorly prepared. In short, even among those who undertake cram schooling, there may be differential causal effects. The evaluation of the effect of cram schooling can be further complicated if we would like to know whether the results of participants is the same as those who did not participate. Since these two groups may be fairly different, their causal effects of cram schooling may also be different.

Previous empirical studies on cram schooling in Taiwan, which mainly used the method of multiple regression analysis, have confirmed both social and individual factors systematically influencing the participation of cram schooling. The studies using national representative survey data have shown that parental levels of education and occupational level are positively related to the degree of participation in cram schooling of high school students (Sun and Hwang 1996; Lin and Chen 2006; Liu 2006; Hwang and Cheng 2008). Parental educational expectation is also found to have

³ In 2003, Taiwan Education Panel Survey, the data of which is a part of the data used for the present research and described in more details later, asked 9th graders if they could choose freely, whether they would attend cram schools. For those who said yes, about 76% undertook cram schooling. For those who say no, about 38% attended cram schools. These findings show that those who undertook cram schooling were either more motivated or had high expectation that cram schooling would work.

independent effect on the participation in cram schooling (Liu 2006).

Other significant individual and social factors found to affect the participation in cram schooling are gender, ethnicity, family income, family type, sib size, and level of urbanization of either birthplaces or school locations (Sun and Hwang 1996; Lin and Chen 2006; Liu 2006). Lin and Chen (2006), however, also conclude that the explanatory power of family and individual factors on the participation in cram schooling is quite small. The small effect of these factors is explained by over 80% of senior high school students having the experience of attending cram schools. Moreover, both Lin and Chen (2006) and Liu (2006) find that the amount of cram schooling and the educational achievement is curvilinear. Liu's research also show that after taking into account of family backgrounds and individual characteristics, the direct effect of cram schooling on academic achievement is reduced about one half.

While these previous studies of cram schooling in Taiwan are helpful in our understanding of the effect of cram schooling, their estimates of the causal effect of cram schooling may still be biased. First of all, these studies have omitted important variables such as the willingness to participate and intelligence. These omitted variables may contribute both the explanation of the participation in cram schooling and academic achievement. Variables related to the school or class learning climate, such as the competitiveness of classmates, are also neglected in the previous research. Furthermore, these studies have not fully explored the possibility of heterogeneous causal effects. As mentioned earlier, it is possible that students of different degree of motivation, prior academic ability, and family socioeconomic backgrounds may benefit differently from cram schooling.

In order to take into account properly these baseline differences and possible heterogeneous causal effects, it would be ideal if an experiment on cram schooling could be carried out. This experiment would randomly assign students to attend

cramming programs or not to attend. Since this kind of experiment is not possible in real life, it would then be necessary to use observational data and proper statistical analysis to control for baseline differences and account for heterogeneous effects. As it will be shown in later discussion, conventional OLS regression method may not be the best statistical tool for this task. Instead, methods such as propensity score matching, which is developed under the counterfactual framework and explicitly taking into account baseline differences and heterogeneity of causal effects, should be considered in estimating the effect of cram schooling.

The Counterfactual Framework and Propensity Score Matching

As long as we do not have experimental design and have only observational studies available to examine the effect of cram schooling, what then can be done to handle selection bias caused by omitted variables and explore possible heterogeneous causal effects? The method used in this research is the propensity score matching, which uses observed family, school, and individual characteristics of students to match students who undertake cram schooling and those who do not and then calculates the average difference in outcomes between these two groups. With proper assumptions, this matching method is able to estimate separately the average causal effect of those who participate in cram schooling and those who do not as well as an overall average estimate of the effect for these two groups combined. The matching method is developed under the framework of the counterfactual causal inference. To explain how this matching method works, it is useful to understand the counterfactual framework of causality with a binary cause which presupposes two potential outcomes for all members of the population.⁴

⁴ The discussion of the counterfactual model and propensity score matching in this paper follows the discussion presented in Morgan and Winship (2007). See also Winship and Morgan (1999), Winship and Sobel (2004), and Morgan and Harding (2006).

If the participation in the cramming school is a random variable, D , that is equal to 1 if the student participates in cram schooling and equal to 0 if not. Using the language of the experimental design, those who undertake cram schooling can be described as experiencing the treatment and those who do not is in the control group. Since every student may or may not undertake cram schooling, for every student there are two potential outcomes student which are denoted as Y^1 and Y^0 . Y^1 is the potential outcome for the individual student participating in cram schooling ($D = 1$) and Y^0 is the potential outcome for the individual student with no cram schooling ($D = 0$). The causal effect of the treatment for every student is defined as: $\delta = Y^1 - Y^0$, that is, the difference between the outcome if the student undertakes cram schooling and the outcome if the same student does not undertake cram schooling. This causal effect on the individual level is not observable since in reality we can only observe one of the outcomes for each student. If we are willing to make certain assumptions about the joint law of Y^1 , Y^0 , and D , then we can identify the average treatment effect on the whole population (ATE):

$$\delta^{ATE} = E[Y^1 - Y^0] = E[Y^1] - E[Y^0]. \quad (1)$$

ATE is a commonly investigated causal effect and estimated in the observational study by a random sample of the population of interest. In an observation study, the researcher faces the situation that a proportion of the population of interest taking the treatment would have fairly different characteristics than those who did not take the treatment. If the proportion of the population taking the treatment is π , then Equation (1) becomes

$$\begin{aligned} \delta^{ATE} = & \{ \pi E[Y^1 | D = 1] + (1-\pi) E[Y^1 | D = 0] \} \\ & - \{ \pi E[Y^0 | D = 1] + (1-\pi) E[Y^0 | D = 0] \}. \end{aligned} \quad (2)$$

Equation (2) can be rearranged and expressed as

$$\delta_{naive} = E[Y^1 | D = 1] - E[Y^0 | D = 0] = \delta^{ATE} \quad (3)$$

$$\begin{aligned}
& + \{E[Y^0 | D = 1] + E[Y^0 | D = 0]\} \\
& + (1-\pi)\{E[\delta | D = 1] - E[\delta | D = 0]\}.
\end{aligned}$$

Equation (3) shows that the naïve estimator, δ_{naive} , an estimator often used in the observational study, is a combination of the true average treatment effect, δ^{ATE} , plus two potential sources of biases. The first potential source of bias, $E[Y^0 | D = 1] + E[Y^0 | D = 0]$, is a baseline bias. This bias exists because in the absence of treatment, the average situation of those in the treatment group would not be the same as those in the no-treatment group. The second source of bias, $(1-\pi)\{E[\delta | D = 1] - E[\delta | D = 0]\}$, is a differential treatment effect bias. This bias exists because the expected treatment effect for those in treatment group and those in the no-treatment group are different.

Equation (2) also shows that δ^{ATE} is a weighted combination of two conditional average treatment effects: the average treatment effect on the treated (ATT) and the average treatment effect on the untreated (ATU). In the present case, ATT is the average treatment effect for those who typically undertake cram schooling for math and ATU is the average treatment effect for those who typically do not participate in cram schooling. ATT and ATU are defined respectively as

$$\delta^{ATT} = E[Y^1 - Y^0 | D = 1] = E[Y^1 | D = 1] - E[Y^0 | D = 1], \quad (5)$$

$$\delta^{ATU} = E[Y^1 - Y^0 | D = 0] = E[Y^1 | D = 0] - E[Y^0 | D = 0]. \quad (6)$$

In order to obtain an unbiased and consistent estimation of ATU, one needs to assume that $E[Y^1 | D = 1] = E[Y^1 | D = 0]$, i.e., the expected treatment effect for those in treatment group and those in the no-treatment group are the same. To obtain an unbiased and consistent estimate of ATT, one needs to assert that $E[Y^0 | D = 1]$ equals to $E[Y^0 | D = 0]$, i.e., no baseline difference between the treated group and the untreated group. In general, the necessary assumption for the unbiased and consistent estimation of ATT is less demanding than for ATU. In the case of the present research, the needed condition for estimating ATT is to assume that those participate in cram

schooling would, on average, do no better or no worse without cram schooling than those who actually have no cram schooling. ATT is an commonly examined subject of interest since if there is no treatment effect on the treated, it is reasonable to assume that the same treatment would not benefit the untreated. In the present research, only if cram schooling has a significant impact on those undertaking such an activity would it be necessary for us to consider the possible effect of extra learning outside of schools on those who do not undertake cram schooling.

In an observational study, the assumption of no baseline difference or the same treatment effect for both the treated and untreated group is very unlikely. However, if one is willing to assume the independence between Y^0 , Y^1 and D conditionally on a set of observable covariates X , then $E[Y^0 | D = 1, X = x] = E[Y^0 | D = 0, X = x]$ and $E[Y^1 | D = 1, X = x] = E[Y^1 | D = 0, X = x]$. If these conditional independence assumptions are satisfied, then one is able to stratify the sample into subgroups conditioning on these covariates to estimate $E[Y^0 | D = 1]$ and $E[Y^1 | D = 0]$. Within each subgroup, the researcher selects a case from the no-treatment group to match a case from the treated group based on observed characteristics of X and calculates the differences in the observed outcomes.

In practice, realization of assumptions of the conditional independence requires a considerable number of observable covariates and the limited sample size makes the conventional method of stratification and matching conditioning on all these variables impossible to implement. Paul R. Rosenbaum and Donald B. Rubin, in a set of papers, developed the method of propensity score matching and solved a variety of practical problems (see Morgan and Harding 2006). The method stipulates that the systematic differences between those who take the treatment and those who do not can be captured completely by a set of observed selection variables S and this conditional independence implies independence conditionally on a specific function of S , called

the propensity score. The propensity score is a one-dimensional summary measure of the probability of being treated and can be noted as $\Pr(D = 1|S)$. This probability is between 0 and 1. The method solves the problem of matching individuals on the whole set of conditioning variables. It is enough to match the treated and the untreated on their propensity scores. One potential drawback of the method is the possibility of no suitable matches for all treatment cases. In fact, if the probability of being treated equal to 1, it is not possible to find a counterfactual in the no-treatment group. In short, one can only estimate the treatment effect for matched cases.

The actual procedure of propensity score matching is fairly straightforward (see Caliendo and Kopeinig 2008). First of all, the propensity score for each case in the sample is estimated with all covariates by a logit or probit regression model. The matching of propensity scores between the treated and untreated cases can be performed by one of the many matching algorithms available for several statistical packages. In general, these matching algorithms can be grouped into four types: exact matching, nearest-neighbor matching, interval matching, and kernel matching. Morgan and Harding (2006: 34) suggested that nearest-neighbor caliper matching with replacement, interval matching, and kernel matching should be preferred to nearest-neighbor matching without replacement. They also recommended matching on both the propensity score and the Mahalanobis metric for achieving balance. After matching is performed, it is important to assess the matching quality. One simple way to assess the matching quality is to perform a two sample t-test to check if there is a significant difference in sample means of each covariate for the treatment and the matched control groups. After the matching quality is verified, one can estimate the specific average treatment effect.

For the present research, the propensity score matching is performed by “psmatch2,” a Stata 10 routine developed by Edwin Leuven and Barbara Sianesi

(2003). The matching algorithm chosen is kernel matching with Epanechnikov kernel and the matching is on both the propensity score and the Mahalanobis metric to achieve balance.

Data and Measures

The present research uses the public released data sets collected by Taiwan Education Panel Survey (TEPS) in 2001 and 2003 (Chang 2003). In 2001, with the support and authorization of the Ministry of Education, National Council of Science, and Academia Sinica in Taiwan, TEPS using multistage stratified sampling method surveyed 20,004 7th graders in 333 junior high schools. These sampled students were surveyed again in their 9th grade. The follow-up sample size is 18,903. The sample size of the public released data is 70% of the surveyed students.⁵ TEPS data were collected by administering the ability test and student's questionnaire in the classroom under a standardized condition. Each surveyed students was also asked to take home a copy of parent's questionnaire for one of his or her parents or guardians to answer, and the answered questionnaire was taken back for field staff to collect. Surveys were also administered to surveyed students' homeroom teachers, Chinese language teachers, English teachers, and Math teachers.

For the present research, I used 2001 and 2003 student data, 2001 parent data, and 2001 data of math teacher's evaluation of surveyed students. The sample size of each data is slightly different. The sample size of the 2001 public released student data is 13,978. After merging this data with the follow-up student data and deleting cases that have no information about math ability test scores, cram schooling for math in 2003, gender, and ability grouping, the sample size reduces to 12,025. For all other

⁵ Please refer to <http://www.teps.sinica.edu.tw/introduction.htm> for basic information about TEPS (in Chinese).

variables used in the analysis, I use either mode or median to replace their missing values to reduce the loss of the sample size.⁶ The sample size for the present research is further reduced to 11,373, which is the analytical sample with common support after the matching.

The present research focuses on estimating the effect of math cramming undertaken in the first semester of the 9th grade. The choice of estimating the effect of math cramming in the 9th grade is due to the fact that 9th graders would face their first senior high school entrance examination held in the second semester. Hence, the main purpose of cram schooling for math should be for this examination. The math ability of these students was also measured by TEPS in the later half of the first semester in 2003. Another reason to study the effect of math cramming is because math learning is largely taken place at school or cram schools rather than at home. Moreover, coaching for math standardized tests is also shown to be more effective (Becker 1990). The original math ability scores given by TEPS are IRT scores (Yang, Tam, and Huang 2004). For the ease of presentation and understanding, I transform the IRT scores into normal curve equivalent (NCE) scores for the sample before matching (N = 12,025), which range from 1 to 99 with a mean of 50 and a standard deviation of 21.06. Table 1 shows that the mean of the math ability NCE scores for the matched sample (N=11,373) is 64.564 and the standard deviation is 29.858. The variable of math cramming in the 9th grade is coded as a dummy variable with 1 indicating the student undertaking math cramming during the first semester of the 9th grade and 0 for no math cramming. Table 1 shows that about 47% of student included for the present research undertook cram schooling in the 9th grade and a similar percentage of students have the experience of attending cram schools or seeking private tutoring

⁶ I also use listwise deletion to deal with missing values and the final result of analysis is very similar to the findings presented in this paper.

ever since they were 5th graders.

Other than variables of the math ability scores in the 9th grade, the experience of math cramming in the first semester of the 9th grade, and student's own initiative in undertaking math cramming, and if students attends a high ability class in the 9th grade, all other variables used for matching are obtained from the TEPS 2001 data. In total, I used 27 variables for propensity score matching. Most of these other variables are variables often considered in previous empirical studies of cram schooling in Taiwan or studies of coaching in other countries (Stevenson and Baker 1992; Sun and Hwang 1996; Powers and Rock 1999; Baker, Akiba, and Wiseman 2001; Briggs 2001; Lin and Chen 2006; Liu 2006). These matching variables can be grouped into three types: (1) student's individual characteristics which include gender, learning habits, and math achievement in the 7th grade, (2) family backgrounds, and (3) school and class characteristics, which include school types and class environment regarding academic competition and ability grouping. Variables such as student's learning habits, prior math achievement, and school or class characteristics are rarely available for previous studies of cram schooling in Taiwan. The following are more detailed description of the measurement and coding the variables used in propensity score matching. Summary statistics of variables are presented in Table 1 for both sample cases included in and excluded from the present study.

[Table 1 is about here]

1. Student's individual characteristics

- (1) Gender: 1 is male and 0 is female.

- (2) The homework subject that spends most time in doing: 1 is math and 0 is other subjects.

- (3) Never let anything distract doing homework since elementary school: This is an ordinal variable treated as a continuous variable in the analysis. The variable ranges from 1 to 4 with 1 indicating and 4 indicating strongly disagree.
- (4) Always review course lessons after school since elementary school: Same as (3).
- (5) Always try to solve difficult problems in learning since very young: Same as (3).
- (6) Math is always a headache: Same as (3).
- (7) Can keep up with math teaching: This ordinal variable and the next two are math teacher's evaluation of surveyed students. The variable is treated as a continuous variable in the analysis and ranges from 1 to 4. 1 means that the student's learning pace is way ahead of teaching, 2 means that the student can keep up with teaching, 3 means that the student cannot keep up with teaching, and 4 means that the student is way behind.
- (8) Math homework performance: This ordinal variable is math teachers to evaluate if students always, sometimes, rarely, or never late in turning in math homework. 1 means always and 4 means never.
- (9) Attend special class for gifted students in the 7th grade: Students are asked if they attend special classes for students who are evaluated to be gifted in certain academic subjects such as math, science, and Chinese or English languages. The variable is dummy coded with 1 meaning yes or 0 meaning no.
- (10) Make own decision about undertaking cram schooling: A dummy coded variable with 1 indicating yes and 0 indicating no.
- (11) Cram schooling experiences: This variable is coded into four categories

including before 4th grade or never, from 5th grade to 7th grade, 7th grade only, and from 5th to 6th grade. The category of “from 5th grade to 7th grade” is the reference group in the regression analysis.

- (12) Math ability IRT scores in the 7th grade: This variable is a continuous variable.

2. Family backgrounds

- (1) Ethnicity: Four ethnic groups are constructed according to parents’ answer about their ethnicity. They are Minnan, Hakka, Mainlander, and Aborigine. Minnan is the reference group in the regression analysis.
- (2) Parental education level: Three parental education levels are constructed according to the highest level of education attained by either parent. Three levels are high school, college, and graduate school. The level of high school is the reference group in the regression analysis.
- (3) Parent occupation: The three types of parental occupation constructed are professional or clerical workers, sales and service workers, and other. The classification is based on the differentiation of white collar and blue collar jobs as well as the consideration of the sample size of each category.
- (4) Monthly family income: The monthly family income is divided into less than NT\$20,000, NT\$20,000 to less than NT\$50,000, NT\$50,000 to less than NT\$100,000, and NT\$100,000 or above.⁷
- (5) Living with both biological parents: This variable is dummy coded with 1 indicating yes and 0 indicating no.
- (6) Sib size: This variable is constructed from student’s answers to four questions regarding the number of younger and older sisters and brothers. This number

⁷ The annual average exchange rate between NT dollars and US dollars is about 34.999 to 1 in 2001 (Directorate-General of Budget, Account, and Statistics, Executive Yuan 2007).

of siblings is double checked and corrected with five questions about whether living with siblings, the number of siblings under 18 years old, if parents are partial towards a particular sibling, and the relationship between siblings.

- (7) Parental educational expectation: This variable is coded into three levels of educational expectation. They are expectation of getting a high school diploma, getting a college degree, and getting a graduate degree. The reference group in the regression analysis is getting a high school diploma.

3. School and class characteristics

- (1) Attend private school: 1 means yes and 0 means no.
- (2) The 9th grade class is a high ability class: 1 means yes and 0 means no.
- (3) Poor class climate for learning: This is an ordinal variable ranges from 1 to 4 with 1 indicating strongly agree and 4 indicating strongly disagree.
- (4) Class average grade is good: Same as (3).
- (5) Classmates often discuss homework or study together: Same as (3).
- (6) Intense academic competition among classmates: Same as (3).
- (7) Classmates often discuss about the entrance examination: Same as (3).
- (8) School location: This variable is about the level of urbanization of the school location. The three levels are rural, small city, and major city. Rural is the reference group in the regression analysis.

Results

Factors influence the participation in cram schooling for math in the 9th grade

Table 2 shows the result of logistic regression of participation in cram schooling for math in the 9th grade on student's individual characteristics, family backgrounds, and school and class characteristics. The first regression model includes often considered variables in Taiwan's previous studies. These variables are student's

gender, cram schooling experiences, family backgrounds variables, and school location. The result of this model is similar to these earlier studies (e.g., Liu 2006). Model 2 to Model 5 are hierarchically nested. Model 2 includes only variables related to student individual characteristics. Model 3 adds family backgrounds variables to the analysis and Model 4 further adds variables related to school and class characteristics. The last model, Model 5, further includes the indicator of prior math ability as measured by the math ability IRT scores in the 7th grade. Since the prior math ability is an outcome of both measured and unmeasured variables in the 7th grade, the addition of this variable can help us to examine if the analysis without this variable is seriously biased in any way.

[Table 2 is about here]

The comparison of regression coefficients of Model 1, Model 2, and Model 3 shows that patterns of effects of variables related to student's individual characteristics and of variables related to family backgrounds do not change much with additional variables included in the analysis and, hence, are fairly independent in their impacts on the chance of participation in math cramming in the 9th grade. This finding also suggests that previous studies, as exemplified by Model 1, may have overestimated the effect of cram schooling without taking into account of student's learning habits or personal traits. The result of Model 4 further shows that some school and class characteristics also have relatively independent effects on the chance of attending cram schools. Model 5 shows that the prior math ability has a significant positive impact on undertaking math cramming in the 9th grade as well. While the addition of this variable reduces the impact of other variables somewhat, the effect seems to be quite independent. Again, this result points to the possibility of

unobserved variables, which may bias the estimation of the causal effect of cram schooling. If such variables exist, however, the possible bias seems rather small.

Specifically, the result of Model 5 indicates that those who undertake cram schooling for math in the 9th grade tend to be female, non-aborigine, living with both biological parents, with fewer siblings, with parents who are more educated and have higher educational expectation. Students who have good learning habits such as spending much time in doing math homework, always review course lessons after school, and always turn in math homework in time are also tend to take on cram schooling for math. Apparently, the previous experience in cram schooling is not favorable for some students, since those who attended cram schools earlier and did not attend persistently tend not to continue cram schooling for math in the 9th grade. Students who can make their own decision about attending cram schools also avoid undertaking cramming activity. These findings reveal that students who undertake cram schooling for math in the 9th grade are either those who have good learning habits and good math ability. Students who attend public schools in more urbanized areas, have more competitive and studious classmates, and have poor class climate in learning also have a better chance of attending cram schools for math. All these factors that have positive effect on the chance of participating in cram schooling for math are baseline differences that need to be taken into account in the estimation of the causal effect and some of which are usually absent in the analysis of previous studies.

Average treatment effects of cram schooling for math in the 9th grade

Built on the models presented in Table 2, Table 3 contrasts the results of OLS regression and propensity score matching (PSM) under different models. Table 3 shows that when the OLS estimation of the gross positive effect of the math

cramming in the 9th grade is about 11 points, which is near one half of the standard deviation of the NCE scores. This obvious increase in the math performance without taking account of baseline differences among those who undertake cram schooling and those do not are probably the phenomenon perceived by parents and students who believe in the positive effect of cram schooling and publicly advertised by cram schools about their success in Taiwan. After the inclusion of variables usually included in the analysis of previous studies (Model 1), the OLS estimation of the effect of cram schooling for math in the 9th grade is reduced about one half to 5.795. The amount of reduction is also similar to earlier empirical studies in Taiwan (e.g., Liu 2006). With only student's individual characteristics in the model (Model 2), the OLS estimation of the cram schooling is 6.571. Further inclusion of variables related to family backgrounds and school and class characteristics (Model 5), the OLS estimate again reduces nearly by one half to 3.757. Model 6 shows that the addition of the math ability in the 7th grade makes the effect of cram schooling even smaller and the OLS estimate becomes 2.784, which is about one half of the effect of math cramming shown in Model 2 and is only one tenth of the standard deviation of the NCE scores. This finding indicates that without the proper account of baseline differences of students at both individual and contextual level, the conventional OLS estimation of the effect of cram schooling is, as expected, upwardly biased.

[Table 3 is about here]

The results of Table 3 reveal that assuming the estimation of PSM method is closer to the true value,⁸ the OLS estimate of the average treatment effect for the

⁸ Morgan and Harding (2006) conducted simulations and showed that in general PSM estimates were closer to the parameter.

whole population (ATE) is downwardly biased. Consistently across models, PSM estimates for the ATE are slightly larger than OLS estimates. The reason for bigger PSM estimation of the ATE is apparently due to the average treatment effect of cram schooling for math in the 9th grade is bigger slightly for those who did not undertake such an activity (i.e., ATU) than for those who did undertake such an activity (i.e., ATT) and for the whole population the proportion of students who did not take on cram schooling for math in the 9th grade is also a bit larger. Table 3 further shows that average treatment effects on the treated (ATT) are also consistently a little bit smaller than OLS estimates across models. Moreover, with the addition of the prior math ability into the analytical model, differences between the OLS estimate and all PSM estimates are narrowed. As expected, the addition of the prior math ability reduces the effect of cram schooling for math by about 1 NCE score with the largest reduction in the case of the ATU (about 1.3 points) and the smallest reduction in the case of the ATT (0.4 point). Once again, the difference between estimates of Model 5 and Model 6 suggests the possible existence of omitted variables. The bias caused by omitted variables on the estimation is not too big after a rich set of variables has been included in the analytical model.

I further explore the possibility of heterogeneous causal effects of math cramming on those who actually undertake math cramming in the 9th grade (ATT). I use three variables in turn to stratify the analytical sample and then perform the matching within each stratum and calculate the difference in outcomes within each stratum. These three variables for sample stratification are propensity scores for math cramming in the 9th grade, math ability scores in the 7th grade, and parental educational levels. For each of the first two variables, I stratify them into 5 separate strata in terms of quintiles and then recombine these strata into 2 strata as shown in Table 4 and Table 5. For parental educational levels, I use three levels of parental

education as strata and then combine college level and graduate school level as one stratum (see Table 6).

Table 4 shows that with or without the prior math ability score included for matching, the effect of math cramming in the 9th grade is nonlinearly related to the tendency of undertaking math cramming when propensity scores are stratified into five strata. The estimated causal effect is largest for those who have the lowest propensity to undertake such an activity. In the fourth stratum, the estimated causal effect becomes smaller as the tendency for math cramming is increasing and reduces to about one half the size of the ATT for the total sample. Then, the size of the causal effect bounces back in the fifth stratum to about the size of the ATT for the total sample. This changing pattern of causal effects may not come as a surprise since those who have higher tendency of math cramming are those who are more studious and motivated, have better prior ability, and have better family backgrounds. In short, those who stand on a higher baseline in the first place may have already learned what needs to be learned and will not gain as much as those whose baseline is lower. However, the pattern also indicates that for those who are highly competitive and with highest math ability, math cramming may help them to reach higher than those who are just a rank below them. When the propensity scores are stratified into two strata with the first to the third stratum combined as one stratum and the fourth and the fifth as another stratum, the result essentially confirms the case that math cramming is more useful for those who are less likely to undertake such an activity in the 9th grade. However, since the absolute size of the causal effect for the students of the 1st to 3rd stratum is still fairly small, math cramming in the 9th grade may not be much of the help for them to surpass the performance of those who are more motivated and more prepared in the competitive entrance examination.

[Table 4 is about here]

In the case of the stratification of prior math ability, a similar pattern can be observed as sizes of the causal effect of math cramming are related to strata of prior math ability scores in a U shape. The smallest effect is observed in the 3rd stratum (see Table 5). In general, math cramming would benefit slightly more for those whose prior math ability is lower than for those whose ability is higher. The result for recombined strata also confirms this observation. Finally, in the case of the stratification of parental educational levels, the pattern of changing causal effects clearly shows that math cramming is more effective for students whose parents have only high school education. The ATT for students whose parents are high school graduates is almost twice larger than the effect size of those whose parents are college graduates. The causal effect for students' parents who have graduate school degrees is negative. However, for this stratum, the matched sample size of the treated ($N = 171$) is slightly smaller than the matched sample size of the untreated ($N = 179$). This may cause the estimation of the ATT somewhat unreliable. It should be said once again that the estimated causal effect is fairly small. Cram schooling per se will not likely to change the fate of students with disadvantaged family backgrounds. After all, those who have better educated parents will also be more likely to attend cram schools and they will also benefit from cram schooling even if the effect is smaller.

[Table 5 and Table 6 are about here]

Conclusion and Discussion

Cram schooling is prevalent among students in Taiwan. The competitive entrance examination system tied with the hierarchically ranked system of secondary schools

and institutions of higher education drive students and their parents to seek supplementary learning opportunities with private family resources. The belief that cram schooling is helpful for gaining a competitive edge is also a factor that contributes to the growth of *Buxiban*. This growth continues in Taiwan despite the fact that possible negative impacts of cram schooling are well acknowledged by the public and that the educational reform in the last decade has made the college education much more accessible. Students in Taiwan are always under considerable pressure to achieve academically ever since they enter elementary schools. With this societal background in mind, the purpose of the present research is to assess the causal effect of cram schooling for math in the 9th grade, which is the time when junior high students face their first major entrance examination for senior high schools and make decision about whether to choose academic or vocational track.

An accurate assessment of the causal effect of cram schooling for math, however, needs to take into account seriously all possible baseline differences between the group of students who undertake cramming activities and the group who do not. It is also possible that cram schooling have differential effects for different kinds of students. The understanding of how cram schooling may have a positive effect on academic performance also alerts us to take seriously baseline differences and possible heterogeneous causal effects at both the level of individual student and the level of student's learning environments. These are questions related to issues of self-selection bias and omitted variables. Conventional regression methods like the OLS regression in general are not the most suitable statistical tools to deal with these issues. The present research uses the method of propensity score matching, which is developed under the framework of counterfactual causal inference, to tackle these issues and attempts to get a more accurate estimation of cram schooling on math performance. What propensity score matching attempts to achieve is to make those

who actually experienced the treatment of interest, which in this case is cram schooling for math in the 9th grade, with those who have no such an experience comparable under the assumption that after the matching all differences between treated and untreated are eliminated except their treatment status. If this assumption is valid, then the result obtained by the method of propensity score matching should be close to that obtained by an experimental design with randomization. With proper assumptions, the method can also give us separate estimations of causal effect for the whole population, those who are actually exposed to the treatment, and those who do not.

The present research uses the data set provided by Taiwan Education Panel Survey. TEPS data sets collected in 2001 and 2003 give the present research an advantage over previous studies in cram schooling by offering a rich set of variables related to student's individual characteristics, family backgrounds, and school and class characteristics. By being a panel survey, the research can also explore the advantage of using outcome variables of interest obtained from the previous survey. In this case of the present research, this outcome variable of interest is the math ability score in the 7th grade. With this outcome variable, the research may be able to control for the impact of omitted variables on the estimation of the causal effect of a particular cause on the later math performance.

The major findings of the present research are revealing in several ways. First of all, the findings show that after taking into account of baseline differences in the participation in math cramming, the average causal effect of math cramming in the 9th grade is positive but fairly small. Moreover, the effect of math cram differs depending on the tendency of undertaking such an activity, on prior math ability, and on parental education levels. In general, students who are more likely to attend cram schools, who have better prior math ability, and whose parents are highly educated would benefit

less from math cramming than their fellow students who do not have these tendencies or advantages. While the present research have not explored further the possible effects of math cramming for those who actually did not attend cram schools, the result of PSM estimation of the effect of math cramming on these students suggests that math cramming would probably even more beneficial to them. Since these students include those who are likely to have disadvantaged backgrounds, this counterfactual finding has the policy implication for government to implement after-school programs for the disadvantaged students. Studies in the U. S. have found positive effects of after-school programs focusing on academic instruction (e.g., Black, Doolittle, Zhu, Unterman, and Grossman 2008; see also Bodilly and Beckett 2005). It should be cautioned, however, that the effect of cram schooling is fairly small. An academically focused after-school program that aims to reduce the inequality between disadvantaged and advantaged students in academic achievement may not be able to change the learning gap. Furthermore, the advantaged students may seek cram schooling or private tutoring with family resources.

Even though the positive effect of cram schooling for math in the 9th grade is found to be fairly small in the present research, I doubt, however, if this result will be able to persuade students or parents who believe in such an effect not to undertake cram schooling. After all, for students who are at the top of the competitive pyramid, one or two points still matter a lot if a small change of scores means the chance of being admitted to a desired top-ranked school, university, or academic program. For those who are not so competitive, cram schooling may have a positive psychological effect not accounted for in the present research. In a society that emphasizes effort not innate ability as the basis of academic achievement, undertaking cram schooling matters a lot since it has its cultural significance (Stevenson and Stigler 1992).

On the methodological front, the difference between the estimated effects of the

OLS regression method and the method of PSM is very small. This finding supports the view that if the OLS regression model meets all of the assumptions of regression analysis, the OLS regression method will get estimates close to the method of PSM. However, if the assumptions are not met, then propensity score matching has the advantages, among others, of being a nonparametric method, more efficient, and able to provide the information about the comparability of treated and untreated cases (Harding 2003). Of course, a researcher normally will not be able to know in advance or fully if regression assumptions are violated. For the present research, I have the advantage of using TEPS data sets, which not only provided a rich set of variables but also an outcome variable of interest of an earlier panel, to examine possible biases caused by omitted variables or inappropriate functional forms.

The method of PSM has its limitations. The results of Table 3 also show that when important variables are not available for matching, then the method of PSM by itself cannot overcome the problem of omitted variables. Furthermore, at present, available PSM matching routines for common statistical packages cannot be employed easily to handle treatment variables other than binary variables. For many-valued treatment, researchers will need to recode each value into a binary variable and perform matching for each pair of binary treatment variables (see Morgan and Winship 2007: 53-57). The present research has only examined the causal effect of math cramming in the 9th grade which is taken as a binary variable. Obviously, many important issues about the effects of cram schooling will need to consider cram schooling as many-valued treatments. For instance, the effect of cram schooling may be cumulative, which involves the number of hours, semesters, or academic subjects of cramming activities. These are all important issues about cram schooling that need to deal with many-valued treatments.

Future studies of the effect of cram schooling should also consider international

comparisons. Neighboring societies of Taiwan like China, Japan, and South Korea, which have similar institutional arrangements in education and share Confucian belief in meritocracy, also experienced the seemingly non-stoppable expansion of cramming industry (Zeng 1999; Bray 2003). Whether or not cram schooling has similarly small effect in these countries should be examined with appropriate methods and data in the future.

Table 1 Summary statistics for sample cases included and excluded from the study

Variable	Included sample cases (N = 11373)		Excluded sample cases		
	Mean	Std. Err.	Mean	N ¹	Std. Err.
9 th grade math ability NCE score	64.564	29.858	52.335	1713	29.204
Math cramming in 9 th grade	.468	.499	.334	1790	.471
Male	.504	.500	.548	2586	.498
Spending most time in doing math homework	.262	.440	.232	2605	.422
Never let anything distract doing homework	2.067	.820	2.124	2605	.860
Always review course lessons after school	2.292	.824	2.337	2605	.883
Always try to solve difficult problems in learning	1.980	.756	2.038	2605	.813
Math is always a headache	2.163	.974	2.068	2605	.952
Can keep up with math teaching	2.275	.747	2.580	2061	.847
Math homework performance	3.489	.726	3.23	2061	.878
Attend special class for gifted students	.077	.267	.070	2605	.255
Make own decision about undertaking cram schooling	.736	.441	.485	2605	.500
Cram schooling experiences			.511		
Before 4 th or never	.478	.500	.307		.500
7 th grade only	.334	.472	.113	2605	.461
5 th to 6 th grade only	.101	.301	.069		.317
5 th to 7 th grade	.087	.282			.253
7 th grade math ability IRT score	.076	.982	-.340	2580	1.00
Ethnicity			.588		
Minnan	.734	.442	.104	2452	.492
Hakka	.116	.321	.091		.305
Mainlander	.117	.321	.053		.288
Aborigine	.032	.177			.225
Parental education level					
High school	.676	.468	.604	2605	.489
College	.289	.453	.374		.484
Graduate School	.035	.184	.021		.143

1. According to the source of data, the excluded sample size is different for each variable.

Table 1 (continued)

Variable	Included sample cases (N = 11373)		Excluded sample cases		
	Mean	Std. Err.	Mean	N ¹	Mean
Parental occupation					
Professional or clerical	.338	.473	.244	2605	.429
Sales or service	.238	.426	.190		.392
Other	.425	.494	.566		.496
Monthly family income					
Under NT\$20,000	.092	.289	.169	2452	.375
NT\$20,000 – Less than NT\$50,000	.412	.492	.422		.494
NT\$50,000 – Less than NT\$100,000	.356	.478	.292		.455
NT\$100,000 or above	.140	.347	.118		.323
Living with both biological parents	.816	.388	.636	2605	.481
Sib size	1.773	1.285	1.738	2516	1.390
Parental educational expectation					
High school diploma	.096	.294	.148	2452	.356
College degree	.654	.476	.658		.475
Graduate degree	.250	.433	.194		.395
Attend private school	.119	.323	.109	2605	.311
The 9 th grade class is a high ability class	.187	.390	.149	2605	.356
Poor class climate for learning	2.828	.834	2.767	2605	.882
Class average grade is good	2.379	.860	2.341	2605	.898
Classmates often discuss homework or study together	2.128	.780	2.170	2605	.831
Intense academic competition among classmates	2.160	.843	2.188	2605	.882
Classmates often discuss entrance examination	2.680	.829	2.613	2605	.866
School location					
Rural	.050	.219	.136	2605	.343
Small city	.371	.483	.377		.485
Major city	.579	.494	.486		.500

1. According to the source of data, the excluded sample size is different for each variable.

Table 2 Logistic regression of undertaking math cramming in 9th grade (N=11,373)

Variable	Model 1			Model 2		
	Coefficient (Odds Ratio)	Std. Err.	z	Coefficient (Odds Ratio)	Std. Err.	z
Male	-.054(.947)	.040	-1.35	-.072(.930)	.042	-1.73
Spending most time in doing math homework	.165(1.179)***	.046	3.62	.159(1.172)***	.045	3.55
Never let anything distract doing homework				-.043(.958)	.029	-1.46
Always review course lessons after school				-.095(.901)**	.030	-3.14
Always try to solve difficult problems in learning				.005(1.005)	.031	0.15
Math is always a headache				.068(1.071)***	.021	3.20
Can keep up with math teaching				-.587(.556)***	.033	-18.01
Math homework performance				.110(1.117)***	.032	3.40
Attend special class for gifted students				-.035(.966)	.074	-0.47
Make own decision about undertaking cram schooling				-.716(.489)***	.046	-15.67
Cram schooling experiences						
Before 4 th or never	-.893(.409)***	.076	-11.72	-.951(.386)***	.075	-12.60
7 th grade only	-.609(.544)***	.078	-7.82	-.649(.077)***	.077	-8.40
5 th to 6 th grade	-.354(.702)***	.094	-3.74	-.404(.523)***	.093	-4.33
Ethnicity						
Hakka	-.013(.987)	.064	-0.21			
Mainlander	-.047(.954)	.064	-0.74			
Aborigine	-.763(.466)***	.148	-5.16			
Parental education level						
College	.249(1.283)***	.051	4.90			
Graduate school	-.250(.779)*	.120	-2.09			
Parental occupation						
Professional or clerical	.214(1.238)***	.053	4.04			
Sales or service	.113(1.119)*	.052	2.17			
Family monthly income						
NT\$20,000 – Less than NT\$50,000	.467(1.595)***	.083	5.64			
NT\$50,000 – Less than NT\$100,000	.829(2.292)***	.086	9.59			
NT\$100,000 or above	1.018(2.770)***	.101	10.11			
Living with both parents	.362(1.436)***	.055	6.55			
Sib size	-.110(.896)***	.018	-6.22			
Parental educational expectation						
College degree	.616(1.851)***	.079	7.77			
Graduate degree	.953(2.593)***	.089	10.75			
Attend private school	-.510(.600)***	.063	-8.08			
The 9 th grade class is a high ability class						
Poor class climate for learning						
Class average grade is good						
Classmates often discuss homework or study together						
Intense academic competition among classmates						
Classmates often discuss entrance examination						
School location						
Small city	.336(1.400)**	.107	3.16			
Major city	.579(1.785)***	.106	5.45			
Math ability score in 7 th grade						
Constant	-1.410***	.165	-8.56	2.191***	.202	10.85
Log likelihood		-7155.3471			-7288.1712	
LR χ^2 (df)		1408.36 (22)			1142.71 (13)	
Pseudo R ²		0.0896			0.0727	

*P<.05 **P<.01 ***P<.001

Table 2 (continued)

Variable	Model 3			Model 4		
	Coefficient (Odds Ratio)	Std. Err.	z	Coefficient (Odds Ratio)	Std. Err.	z
Male	-.086(.918)*	.043	-1.99	-.082(.922)	.044	-1.87
Spending most time in doing math homework	.108(1.114)*	.046	2.33	.127(1.135)**	.047	2.72
Never let anything distract doing homework	-.058(.944)	.030	-1.89	-.052(.950)	.031	-1.68
Always review course lessons after school	-.079(.924)*	.031	-2.53	-.072(.930)*	.032	-2.26
Always try to solve difficult problems in learning	.039(1.040)	.033	1.21	.038(1.039)	.033	1.15
Math is always a headache	.039(1.040)	.022	1.76	.034(1.035)	.022	1.54
Can keep up with math teaching	-.424(.654)***	.034	-12.32	-.432(.649)***	.035	-12.41
Math homework performance	.119(1.126)	.034	3.54	.114(1.121)***	.034	3.38
Attend special class for gifted students	-.110(.896)	.076	-1.43	-.047(.955)	.079	-0.59
Make own decision about undertaking cram schooling	-.790(.454)***	.048	-16.62	-.803(.448)***	.048	-16.75
Cram schooling experiences						
Before 4 th or never	-.819(.441)***	.077	-10.60	-.824(.439)***	.078	-10.56
7 th grade only	-.556(.574)***	.079	-7.03	-.547(.579)***	.080	-6.87
5 th to 6 th grade	-.283(.753)**	.096	-2.95	-.305(.737)**	.097	-3.15
Ethnicity						
Hakka	-.070(.933)	.064	-1.09	.008(1.007)	.066	0.12
Mainlander	.035(1.036)	.065	0.53	-.011(.989)	.066	-0.17
Aborigine	-.857(.424)***	.148	-5.80	-.737(.479)***	.150	-4.91
Parental education level						
College	.223(1.250)***	.052	4.31	.210(1.234)***	.052	4.01
Graduate school	-.257(.773)*	.121	-2.12	-.318(.727)**	.122	-2.60
Parental occupation						
Professional or clerical	.207(1.23)***	.054	3.83	.186(1.205)***	.054	3.42
Sales or service	.138(1.148)**	.053	2.61	.100(1.105)	.054	1.86
Family monthly income						
NT\$20,000 – Less than NT\$50,000	.472(1.603)***	.084	5.59	.466(1.594)***	.085	5.47
NT\$50,000 – Less than NT\$100,000	.824(2.280)***	.088	9.37	.823(2.277)***	.089	9.25
NT\$100,000 or above	1.008(2.74)***	.102	9.90	1.036(2.82)***	.104	10.00
Living with both parents	.265(1.303)***	.057	4.68	.268(1.307)***	.057	4.68
Sib size	-.102(.903)***	.018	-5.62	-.093(.911)***	.018	-5.08
Parental educational expectation						
College degree	.537(1.712)***	.082	6.58	.526(1.692)***	.082	6.39
Graduate degree	.742(2.100)***	.092	8.08	.747(2.111)***	.093	8.05
Attend private school				-.549(.578)***	.065	-8.44
The 9 th grade class is a high ability class				-.007(.993)	.054	-0.13
Poor class climate for learning				.105(1.111)***	.025	4.17
Class average grade is good				-.001(.999)	.026	-0.05
Classmates often discuss homework or study together				.064(1.066)*	.031	2.08
Intense academic competition among classmates				-.106(.900)	.027	-3.83
Classmates often discuss entrance examination				.003(1.003)***	.028	0.10
School location						
Small city				.399(1.490)***	.110	3.63
Major city				.688(1.990)***	.110	6.27
Math ability score in 7 th grade						
Constant	.400	.240	1.67	-.274	.279	-0.98
Log likelihood	-6940.6923			-6859.6238		
LR χ^2 (df)	1837.67 (27)			1999.80 (36)		
Pseudo R ²	0.1169			0.1272		

*P<.05 **P<.01 ***P<.001

Table 2 (continued)

Variable	Model 5		
	Coefficient (Odds Ratio)	Std. Err.	z
Male	-.086(.917)*	.043	-1.97
Spending most time in doing math homework	.123(1.131)**	.047	2.64
Never let anything distract doing homework	-.057(.945)	.031	-1.84
Always review course lessons after school	-.083(.920)**	.032	-2.61
Always try to solve difficult problems in learning	.055(1.057)	.033	1.66
Math is always a headache	.011(1.011)	.023	0.48
Can keep up with math teaching	-.362(.697)***	.037	-9.79
Math homework performance	.101(1.107)**	.034	2.98
Attend special class for gifted students	-.080(.923)	.079	-1.01
Make own decision about undertaking cram schooling	-.826(.438)***	.048	-17.12
Cram schooling experiences			
Before 4 th or never	-.804(.448)***	.078	-10.30
7 th grade only	-.531(.588)***	.080	-6.66
5 th to 6 th grade	-.276(.759)**	.097	-2.84
Ethnicity			
Hakka	.016(1.016)	.066	0.24
Mainlander	-.011(.989)	.066	-0.17
Aborigine	-.665(.514)***	.150	-4.41
Parental education level			
College	.187(1.205)***	.053	3.55
Graduate school	-.357(.699)***	.123	-2.91
Parental occupation			
Professional or clerical	.174(1.191)***	.055	3.19
Sales or service	.089(1.093)	.054	1.66
Family monthly income			
NT\$20,000 – Less than NT\$50,000	.464(1.590)***	.085	5.44
NT\$50,000 – Less than NT\$100,000	.815(2.259)***	.089	9.14
NT\$100,000 or above	1.019(2.77)***	.104	9.82
Living with both parents	.243(1.275)***	.058	4.22
Sib size	-.084(.919)***	.018	-4.59
Parental educational expectation			
College degree	.475(1.608)***	.083	5.72
Graduate degree	.659(1.932)***	.094	6.98
Attend private school	-.591(.554)***	.066	-9.03
The 9 th grade class is a high ability class	-.025(.975)	.054	-0.47
Poor class climate for learning	.103(1.108)***	.025	4.06
Class average grade is good	-.001(.999)	.026	-0.05
Classmates often discuss homework or study together	.062(1.064)*	.031	2.00
Intense academic competition among classmates	-.095(.909)***	.028	-3.44
Classmates often discuss entrance examination	-.011(.989)	.028	-0.38
School location			
Small city	.368(1.446)***	.110	3.35
Major city	.636(1.889)***	.110	5.77
Math ability score in 7 th grade	.161(1.175)***	.029	5.59
Constant	-.189	.280	-0.68
Log likelihood	-6843.9479		
LR χ^2 (df)	2031.15(37)		
Pseudo R ²	0.1292		

*p<.05 **p<.01 ***p<.001

Table 3 Average treatment effect of math cramming: Comparisons between OLS and PSM Model (N=11373¹)

Variable	OLS Model	PSM Model			Difference between OLS and PSM (ATE)
		ATE	ATT	ATU	
Model 1 : Math cramming in 9 th grade	11.328*** (.380) ²	--- ³	---	---	---
Model 2 : Math cramming in 9 th grade + Variables of Model 1 in Table 2	5.795*** (.355)	5.903	5.360	6.379	- 0.108
Model 3 : Math cramming in 9 th grade + Variables of Model 2 in Table 2	6.571*** (.329)	6.751	5.889	7.509	- 0.180
Model 4 : Math cramming in 9 th grade + Variables of Model 3 in Table 2	3.720*** (.316)	3.828	2.910	4.645	- 0.108
Model 5 : Math cramming in 9 th grade + Variables of Model 4 in Table 2	3.757*** (.313)	3.817	3.044	4.504	- 0.060
Model 6 : Math cramming in 9 th grade + Variables of Model 5 in Table 2	2.784*** (.264)	2.922	2.639	3.176	- 0.138

1. The sample used for comparing OLS and PSM estimates is the matched sample with common support.

2. Numbers within the parenthesis are standard errors.

3. Model 1 has no matching variable and hence no estimation of ATE, ATT, or ATU.

Table 4 Average treatment effects for those undertaking math cramming (ATT) stratified by propensity scores

Propensity scores	PSM Model 1 (includes all matching variables)			PSM Model 2 (matching without math ability score in 7 th grade)		
	ATT	Matched sample size	Unmatched sample size	ATT	Matched sample size	Unmatched sample size
Total sample	2.636	11,373	15	3.001	11,385	3
1 st stratum (lowest propensity)	3.370	2,260	15	4.945	2,276	1
2 nd stratum	4.307	2,248	27	5.436	2,277	0
3 rd stratum	2.791	2,244	30	3.982	2,274	3
4 th stratum	1.344	2,239	36	1.732	2,277	0
5 th stratum (highest propensity)	2.621	2,178	96	3.133	2,263	14
1 st – 3 rd stratum	3.343	6,821	3	4.486	6,831	0
4 th – 5 th stratum	1.813	4,496	53	2.503	4,550	4

Table 5 Average treatment effects for those undertaking math cramming (ATT) stratified by math ability scores in the 7th grade

Math ability scores in the 7 th grade	PSM Model 3		
	ATT	Matched sample size	Unmatched sample size
Total sample	2.636	11,373	15
1 st stratum (Lowest ability)	3.022	2,253	22
2 nd stratum	3.424	2,250	25
3 rd stratum	2.205	2,254	20
4 th stratum	2.326	2,259	16
5 th stratum (highest ability)	2.927	2,238	36
1 st – 3 rd stratum	2.677	6,815	9
4 th – 5 th stratum	1.957	4,540	9

Table 6 Average treatment effects for those undertaking math cramming (ATT) stratified by parental educational level

Parental educational level	PSM Model 4		
	ATT	Matched sample size	Unmatched sample size
Total sample	2.636	11,373	15
High school	3.347	7,659	32
College	1.789	3,271	25
Graduate school	-.720	350	51
College and above	1.577	3,671	26

References

- Alexander, Karl L., Dorris R. Entwisle, and Linda Steffel Olson. 2007. "Lasting Consequences of Summer Learning Gap." *American Sociological Review* 72: 167-180.
- Aronson, Julie, Joy Zimmerman and Lisa Carlos. 1999. "Improving Student Achievement by Extending School: Is It Just a Matter of Time?" San Francisco: WestEd. Retrieved June 15, 2008 (http://eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/15/ea/c4.pdf).
- Baker, David P., Motoko Akiba, Gerald K. LeTendre, and Alexander W. Wiseman. 2001. "Worldwide Shadow Education: Outside-School Learning, Institutional Quality of Schooling, and Cross-National Mathematics Achievement." *Educational Evaluation and Policy Analysis* 1: 1-17.
- Becker, Betsy Jane. 1990. "Coaching for the Scholastic Aptitude Test: Further Synthesis and Appraisal." *Review of Educational Research* 60: 373-417.
- Berliner, David C. 1990. *What's All the Fuss About Instructional Time? The Nature of Time in Schools: Theoretical Concepts, Practitioner Perceptions*. New York: Teacher College Press.
- Black, Alison Rebeck, Fred Doolittle, Pei Zhu, Rebecca Unterman, and Jean Baldwin Grossman. 2008. *The Evaluation of Enhanced Academic Instruction in After-School Programs : Findings After the First Year of Implementation* (NCEE 2008-4021). Washington, D. C.: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved July 22, 2008 (http://www.mdrc.org/staff_publications_1.html).

- Bodilly, Susan J. and Megan K. Beckett. 2005. *Making Out-of-School-Time Matter: Evidence for an Action Agenda*. Santa Monica, CA: RAND Corporation.
Retrieved July 22, 2008
(http://www.rand.org/pubs/monographs/2005/RAND_MG242.pdf).
- Bray, Mark. 2003. *Adverse Effects of Private Supplementary Tutoring: Dimensions, Implications and Governmental Responses*. Paris: International Institute for Educational Planning. Retrieved November 10, 2007
(<http://unesdoc.unesco.org/images/0013/001330/133039e.pdf>).
- Caliendo, Marco and Sabine Kopeinig. 2008. "Some Practical Guidance for the Implementation of Propensity Score Matching" *Journal of Economic Surveys* 22: 31-72.
- Carroll, John B. 1963. "A Model of School Learning." *Teachers College Record* 64: 723-733.
- Carroll, John B. 1989. "The Carroll Model: A 25-Year Retrospective and Prospective View." *Educational Research* 31: 26-31.
- Chang, Ly-Yun. 2003. *Taiwan Education Panel Survey: Base Year (2001) Student Data and Parent Data* [public release computer file]. Center for Survey Research, Academia Sinica [producer, distributor].
- Department of Statistics, Ministry of Education. 2007. "Summary of Education at All Levels." *Educational Statistics of the Republic of China*. Taipei, Taiwan: Ministry of Education, Executive Yuan. Retrieved February 12, 2008
(http://www.edu.tw/EDU_WEB/EDU_MGT/STATISTICS/EDU7220001/ebooks/edu96/10.pdf?open).
- Directorate-General of Budget, Accounting, and Statistics, Executive Yuan. 2007. *Statistical Yearbook of the Republic of China 2006*. Taipei, Taiwan:

- Directorate-General of Budget, Accounting, and Statistics, Executive Yuan.
Retrieved July 20, 2008
(http://eng.dgbas.gov.tw/public/data/dgbas03/bs2/yearbook_eng/y139.pdf).
- Education Bureau, Kaohsiung City Government. 2008. *All Cities and Counties Short-Term Buxiban Information Management System*. Kaohsiung, Taiwan: Kaohsiung City Government. Retrieved July 8, 2008
(<http://bsb.edu.tw/afterschool/english/index-e.jsp>).
- Entwisle, Dorris R., Karl L. Alexander and Linda Steffel Olson. 1997. *Children, Schools and Inequality*. Boulder, Colorado: Westview Press.
- Entwisle, Dorris R., Karl L. Alexander and Linda Steffel Olson, 2001. "Keep the Faucet Flowing: Summer Learning and Home Environment." *American Educator* 25 (3): 10-15, 47.
- Gettinger, Maribeth. 1985. "Time Allocated and Time Spent Relative to Time Needed for Learning as Determinants of Achievement." *Journal of Educational Psychology* 77: 3-11.
- Government Information Office. 2001. "ROC Educational Reform." *The Republic of China Yearbook-Taiwan 2001*. Taipei, Taiwan: Government Information Office, Executive Yuan. Retrieved February 12, 2008
(<http://www.gio.gov.tw/taiwan-website/5-gp/yearbook/2001/chpt17-3.htm#26>).
- Harding, David J. 2003. "Counterfactual Models of Neighborhood Effects: The Effect of Neighborhood Poverty on Dropping Out and Teenage Pregnancy." *American Journal of Sociology* 109: 676-719.
- Leuven, Edwin and Barbara Sianesi. 2003. "Psmatch2: Stata Module to perform full Mahalanobis and Propensity Score Matching, Common Support Graphing, and Covariate Imbalance Testing." Retrieved October 17, 2007
(<http://ideas.repec.org/c/boc/bocode/s432001.html>, version 3.0.0.).

- Lin, Da-Sen and Yi-Fen Chen. 2006. "Cram School Attendance and College Entrance Exam Scores of Senior High School Students in Taiwan." *Bulletin of Educational Research* 52 (4): 35-70. (in Chinese)
- Liu, Jeng. 2006. "The Transition, Efficacy, and Stratification of Cram Schooling in Taiwan." *Bulletin of Educational Research* 52 (4): 1-33. (in Chinese)
- Marks, Gary N., John Cresswell, and John Ainley. 2006. "Explaining Socioeconomic Inequalities in Student Achievement: The Role of Home and School Factors." *Educational Research and Evaluation* 12: 105-128.
- Morgan, Stephen L. and David J. Harding. 2006. "Matching Estimators of Causal Effects Prospects and Pitfalls in Theory and Practice." *Sociological Methods and Research* 35(1): 3-60.
- Morgan, Stephen L. and Christopher Winship. 2007. *Counterfactuals and Causal Analysis: Methods and Principles for Social Research*. Cambridge: Harvard University Press.
- Powers, Donald E. and Donald A. Rock, 1999, "Effects of Coaching on SAT I: Reasoning Test Scores." *Journal of Educational Measurement* 36 (2): 93-118.
- Shavit, Yossi and Hans-Peters Blossfeld, eds. 1993. *Persistent Inequality: Changing Educational Attainment in Thirteen Countries*. Boulder, CO: Westview.
- Stevenson, David L. and David P. Baker. 1992. "Shadow Education and Allocation in Formal Schooling: Transition to University in Japan." *American Journal of Sociology* 97: 1639-1657.
- Stevenson, David L. and James Stigler. 2002. *The Learning Gap: Why Our Schools are Failing, and What We Can Learn from Japanese and Chinese Education*. New York: Summit Books.
- Sun, Ching-Shan and Yih-Jyh Hwang. 1996. "Shadow Education, Cultural Capital

and Educational Attainment.” *Taiwanese Journal of Sociology* 19: 95-139. (in Chinese).

The Commission on Education Reform. 1996. *The General Consultation Report for Education Reform*. Taipei, Taiwan: The Commission on Education Reform, Executive Yuan. Retrieved February 12, 2008 (<http://www.sinica.edu.tw/info/edu-reform/farea2/>). (in Chinese)

Winship, Christopher and Stephen L. Morgan. 1999. “The Estimation of Causal Effects from Observational Data.” *Annual Review of Sociology* 25: 659-707.

Winship, Christopher and Michael Sobel. 2004. “Causal Inference in Sociological Studies.” Pp. 481-503 in M. Hardy, ed., *The Handbook of Data Analysis*. Thousand Oaks, CA: Sage.

Yang, Meng-Li, Tony Tam, and Min-Hsiung Huang. 2004. *Psychometric Report for the Abilities Test of TEPS 2001*. Taipei: Academia Sinica. Retrieved November 19, 2007 (<http://www.teps.sinica.edu.tw/description/TestingReport2004-2-10.pdf>). (in Chinese)

Zeng, Kanming. 1999. *Dragon Gate: Competitive Examinations and Their Consequences*. London: Cassell.